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ROCKS and MINERALS

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MARCH, 1932

Whole No. 23



1930

Courtesy of Ramon Conover.

Dump of the Pyrrhotite Mine, Anthony's Nose, near Peekskill, N. Y.

Featured in This Issue:

Amber. *By Walter J. Beichert, LL. B., B. S., M. D.*

Minerals As Souvenirs. *By Erwin Frederick Gross, LL. B.*

The Treatment of Gem Stones by Heat.

By George O. Wild.

Jet. *By W. E. Howarth.*

The Fluorite Deposits of Southern Illinois and Kentucky.

By Frederick H. Pough.

A NON-TECHNICAL MAGAZINE

—ON—

MINING · PROSPECTING · GEOLOGY · MINERALOGY

THE BULLETIN BOARD

Rocks and Minerals Monthly Fund

Founded by William C. McKinley of Peoria, Illinois

As soon as \$5,000 has been contributed ROCKS AND MINERALS will come out monthly without any increase in subscription rates.

Those who have been contributing to the Monthly Fund, to have the magazine come out as a monthly, will be gratified to know that the Fund is growing. A separate account is kept in the bank of this Fund and interest is paid upon the balances.

Besides a few larger-gifts, the Fund has added to through those who have written the Editor for information, and enclosed a small Honorarium for the trouble they were putting him to, and by others, who in ordering books or minerals, or in renewing subscriptions, have added an extra amount to their check with requests to place this extra amount to the Fund.

We hope the Fund may eventually reach the \$5,000 necessary to make the magazine a monthly, when we will try the further experiment of issuing ROCKS AND MINERALS each month.

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WANTED: Correspondents in all parts of the world who will be kind enough to send us notes and news items on minerals, etc., that they think may be interesting to the subscribers of ROCKS AND MINERALS. Such as are available we shall be very glad to print in the magazine.



ROCKS and MINERALS

A NON-TECHNICAL MAGAZINE

—ON—

MINING—PROSPECTING—GEOLOGY—MINERALOGY

Published
Quarterly

Founded
1926

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and opinions expressed in their respective articles.*

ROCKS AND MINERALS

PEEKSKILL, N. Y., U. S. A.

The Official Journal of the Rocks and Minerals Association

We Want Your Vote!

Your friends, relatives, children—see that they vote in the National Rock and Mineral Contest. Every ballot counts.

THE LEADERS

(as of January 25th)

ROCKS		MINERALS	
Granite	5531	Quartz	3304
Marble	1384	Gold	2961
Coal	482	Garnet	640
Total votes cast—8380		Total votes cast—8380	

With 8380 votes cast to date, with subscribers, readers, advertisers, magazines, newspapers, schools and clubs giving us their full support, the National Rock and Mineral contest is now on in full swing. Balloting during the past two weeks has been unusually heavy and the indications are that this is only the beginning of what will be a persistent and steadily increasing number of votes cast. New York leads with 1414 votes cast; Pennsylvania is second with 940 and California is third with 801.

Granite appears the most popular among rocks and its lead over marble, its nearest rival, is now almost 5 to 1.

It is among minerals where competition is more keen as the fight for leadership is center-

ed on two minerals—gold and quartz. Gold had been in the lead, with a slight edge over quartz, but now the conditions are reversed and quartz is in the lead. The finish of the race is still a long way off and anything may happen before that time is reached and so upsets may be looked for.

Though a considerable number of votes are forthcoming from readers of ROCKS AND MINERALS, we are not satisfied with these alone. Our wish is not to have a National Rock and Mineral chosen by specialist; only the choice of the people should prevail. We want every person—young or old—to take an interest and express their choice in some two specimens which they feel should covet national honors.

(To be detached along line)

ROCK and MINERAL VOTE

My Choice

for a National Rock and a National Mineral typical of the United States

The names printed below have been selected by well-known geologists and mineralogists. Make a mark in the square at the left indicating your choice. If, however, the rock and mineral you would choose is not printed on the ballot, write in the names of those you would accord national honors.

ROCKS AND MINERALS Magazine will announce date Contest closes in its September, 1932 issue.

Vote for	ROCKS		MINERALS	
	<input type="checkbox"/>		<input type="checkbox"/>	
ONE	<input type="checkbox"/>	Granite	<input type="checkbox"/>	Hematite
	<input type="checkbox"/>	Gneiss	<input type="checkbox"/>	Gold
	<input type="checkbox"/>	Marble	<input type="checkbox"/>	Garnet
Rock	<input type="checkbox"/>	Limestone	<input type="checkbox"/>	Quartz
	<input type="checkbox"/>	Sandstone	<input type="checkbox"/>	Pyrite
	<input type="checkbox"/>	Schist	<input type="checkbox"/>	Calcite
and	<input type="checkbox"/>	Slate	<input type="checkbox"/>	Limonite
	<input type="checkbox"/>	Coal	<input type="checkbox"/>	Mica
ONE	<input type="checkbox"/>	Serpentine	<input type="checkbox"/>	Chalcopyrite
	<input type="checkbox"/>	Shale	<input type="checkbox"/>	Sphalerite
Mineral	<input type="checkbox"/>	Conglomerate	<input type="checkbox"/>	Galena

Mail to Editor, National Rock and Mineral Contest,

ROCKS and MINERALS Magazine,

Peekskill, N. Y.

Name of Voter.....

City and State.....

(To avoid cutting of magazine, send in your choice on a post card.)

ROCKS and MINERALS

Edited and Published by Peter Zodac

PUBLISHED
QUARTERLY



MARCH
1932

AMBER

— By —

WALTER J. BEICHERT, LL. B., B.S., M.D.,

520 Amsterdam Ave., New York, N. Y.

Nothing would seem to be easier than to decide off-hand whether any natural object which happens to fall under our notice should be classed in the animal kingdom, in the vegetable or in the mineral kingdom. Yet the student of natural science soon finds that these so-called "kingdoms of nature", instead of being sharply separated one from the other, are surrounded by frontiers of a very unscientific character. The wall that was supposed to form an impassable barrier turns out, upon close inspection, to be the frailest possible fence which, with the advance of knowledge, has to be broken down, first at one point and then at another. So intimate is the connection between the animal and vegetable worlds, that it occasionally becomes a nice question to determine whether a given organism should find its place in the one sphere or the other, or should not rather occupy a neutral border land between the two. But surely no such difficulty can possibly arise in the case of minerals. In the mineral world, we come in contact with the bodies which not only have never possessed life, but so far as we can judge, have been produced without the operation of any living agency. Nevertheless, the mineralogist is not altogether free from embarrassment—like the zoologist and the botanist, he finds it impossible to draw a hard and fast line around the objects

of his study, and there are times when he is perplexed to know whether he should, or should not, include a given substance in the mineral kingdom. Take for instance, a piece of amber. Is it to be called a mineral or not?

A piece of amber is so familiar an object that it is needless to occupy a single line in describing its appearance or its properties. If we have not often seen the amber in its rough state, we at least know it well enough when worked into ornamental forms. The strings of amber beads, or the mouth-piece of the pipe, will furnish specimens to be found in almost every household. So beautiful a substance is naturally claimed as an ornamental stone by all; it is described in our standard treatises on mineralogy, and it figures in every mineralogical system. Moreover, in some parts of the world the amber is dug out of the earth, and even systematically mined for, just as any other mineral substance might be worked. All this looks very much as though we should be justified in regarding amber as a true mineral. And yet it needs but a slight examination of the body to suggest that the relations of amber lie rather among vegetable products than in the mineral world.

If we are in doubt about the nature of any given substance the safest course is to look for some other substance, of

known origin, which it resembles so closely that a comparison may be fairly made between the two bodies. In this way we may be able to argue from that which is known to that which is unknown, and such an argument from analogy is perfectly legitimate in any scientific inquiry. Let us then, seek for some amber-like substance of whose nature and origin we really know something, in order that our knowledge of this body may throw light upon the history of a piece of amber.

When it is required to produce an imitation of amber, the manufacturer does not substitute any other mineral substance or even a piece of yellow glass, but he has recourse to some of those resinous bodies which are brought into this country for the use of varnish. The favorite substitute for amber is either COPAL or GUM ANIME. Samples of these bodies may be obtained from a chemist, and on placing them by the side of a piece of amber, the similarity is unmistakable. In color and luster, in transparency and refractive power, in hardness and density, they run so close together that it often requires a good judge to distinguish between them, especially if the specimen happens to be polished. The amber, it is true, is rather harder, and less brittle, so that it is more easily worked in the lathe; but such differences escape superficial observation. Moreover, these resinous substances agree with amber in being fusible and combustible and being capable of solution in the same liquids. Amber varnish, for example, may be made by dissolving amber in hot oil and oil of turpentine; and in like manner, copal varnish may be made with the same solvents. Again the chemist finds on analysis that the amber, the copal, and the anime have, speaking broadly, the same ultimate composition. All these bodies contain only the three elements called carbon, hydrogen, and oxygen—elements which are not characteristic constituents of minerals, but are, on the contrary, extremely common in vegetable products.

In fact the copal and the anime are known to be resinous bodies which have exuded from certain trees. In many parts of the world the formation of these bodies may be witnessed in the forests, just as the exudation of gum from a plum tree may be witnessed in our own gardens. Knowing, then, the vegetable

origin of copal, we may fairly suspect a similar origin for amber. And this suspicion is converted into something like certainty when we examine the subject more narrowly.

On looking over a large number of pieces of amber, we may occasionally find one which encloses a fragment of vegetable matter, such as a bit of bark or a morsel of a leaf. More frequently however, the included bodies are the remains of insects and spiders, sometimes in a singularly beautiful state of preservation. The "fly" in amber has come to be a proverbial expression and has furnished the poet with many a metaphor. How such an object got into the amber is not very puzzling, not more than the famous problem as to how the apple got inside the dumpling. The enigma is immediately solved by examining a number of pieces of copal and anime, for in some of these we may be sure to find enclosures of almost the same kind. In the case of these resins, it is clear that the substance when in a liquid state flowed over the surface of the tree from which it exuded, and having entangled any little insect which happened to be within reach, slowly hardened around it, and thus sealed it up in a delicately-tinted, transparent shrine. Exactly the same kind of action explains the origin of the flies in amber. They likewise must have been entrapped when the enveloping substance was in a liquid condition; and we infer that the liquid amber when first poured out must have been of tolerably thin consistency, since it has allowed the most delicate parts of the insects to be preserved in an almost uninjured condition. The occasional presence of a wing or a joint of the leg at some distance from the body of the insect tells of the helpless struggle which the imprisoned creature must have made to free itself from the vicious medium in which it was destined to be entombed. So plentiful are such organic remains in association with some of our resins, that anime is said to have obtained its name from this circumstance; gum anime being an animated gum. Incidentally, it may be remarked that the term "gum" should be restricted to such bodies as are soluble in water or are at least softened by it, while the term "resin" is restricted for those bodies which are not affected by water. Many exudations are mixtures of substances belonging to the two

classes and are therefore termed "gum-resins." If the natural resin as it flows from the tree be mixed, not with gum but with oil, the product is then known as a "balsam."

It appears that resinous exudations are not necessarily definite chemical compounds but are regarded, in most cases, as mixed bodies of variable composition. Such too, is the case with amber. A careful chemical study of this material shows that, so far as from being a simple resin, it contains two or three distinct kinds of resinous bodies with a small proportion of certain other constituents, such as an acid called "succinic acid."

One of these resins, however, is dominant, forming nearly nine-tenths of the amber and this principal constituent has been isolated by Professor Dana as a distinct mineral species to which he has given the name "succinite." The amber itself cannot in strictness be regarded as a true species, inasmuch as it is a mixed body and the scientific notion of a mineral species carries with it the idea of homogeneity, or uniformity of composition. A mixture of minerals is, generally speaking, a rock and not a mineral species.

Succinum, from which the specific term "succinite" is derived, was the Latin word for amber and this alone is sufficient to show that even the Romans connected it with succus, the juice or sap or exudation of a tree. In fact the occurrence of organic remains enveloped in amber was much too striking a fact to be overlooked by any one who had much to do with the material, while the significance of these remains was easily understood even by the unscientific observers. Pliny's account of the origin of amber is sufficiently accurate and even the myths of the ancient poets are not altogether destitute of foundation. According to the Greek legend, amber was the petrified tears shed by the sisters of Phaeton who were transformed into poplar trees while bewailing their brothers' death. The idea of a vegetable exudation evidently lies at the root of this legend.

Altogether several resins closely resembling amber are produced at the present day; it can hardly be said that any true amber is now in course of formation. The trees which yielded amber flourished during part of the Tertiary period but have long since become extinct. The resinous substance which they produced

became embedded in the earth, and in the course of time gradually hardened; hence amber is best described as a fossil resin. Literally the term "fossil" signifies something which is "dug up", the word being derived from the latin verb "fadio", "to dig". It was accordingly used by the old writers to designate anything in the shape of a mineral substance, such as a piece of iron ore; but in modern science the term has become conveniently restricted to denote the remains of some organism, dug out of the earth in a more or less mineralized condition, and generally representing some form of life which has become extinct. We speak for example of a fossil shell or a fossil coral, and in a like manner we may refer to amber as a fossil resin. Such fossil resins, notwithstanding their organic origin, are admitted by courtesy into the mineral kingdom. They mark the meeting point where the mineralogist and the botanist verge.

Mineralogists are acquainted with a large series of fossil resins, but amber is the only one of any commercial importance.

It was shown many years ago that the amber-yielding trees must have closely been allied to the pine trees of the present day. Pieces of wood, more or less altered, are occasionally found in such intimate association with the amber as to prove beyond doubt that they represent the very trees which yielded the fossil resin. The amber is found attached to the wood, or penetrating between the wood and the bark, or even between the rings of the stem, which indicate annual growth. These amber trees, as we learn by studying the associated remains, were accompanied by various species of oak, beech, willow and camphor trees, ferns and other plants, mostly belonging, however, to species which are no longer living, and thus indicating the remote antiquity of the amber flora.

As to the animal remains which are enshrined in amber these consist of just such creatures as we might expect to find creeping over the trunks of trees in the amber forests. They are chiefly insects, spiders and small crustaceans, like woodlice.

It is not surprising that the spiders are especially numerous inasmuch as these creatures would be found dwelling beneath the bark or seated on the surface

of the tree in such positions as to be readily overwhelmed by the flowing amber. A piece of a bird's feather has been recorded among the enclosures in amber, but it need hardly be said that specimens with small fish and even frogs, such as are occasionally offered for sale as remarkable curiosities and are often figured in old works on natural history, are nothing but artificial productions. A suitable piece of amber is skillfully hollowed out into a cavity upon its under side, and into this cavity the organism is introduced; the orifice is then neatly sealed up so that the mode of insertion is not detected by unpracticed eyes. It is worth noting that two pieces of amber may be readily united by smearing the surfaces with linseed oil and pressing them together while warm. In like manner, it is merely necessary to steep the amber in hot oil in order to soften it so that it may be bent into almost any shape desired.

Looking at the geographical distribution of amber, it is clear that the extinct trees which yielded this resin must have flourished over a very wide area; while the vast quantity of amber which has for so many ages been obtained from the Baltic coast indicates the local luxuries of the amber pines.

All over the wide plains of North Germany, amber may be found, in association with the lignites of the Tertiary series, but its principal locality is on the Prussian shores of the Baltic sea. There it is found in the "Amber earth," which is a loose clayey sandstone, presenting, when fresh, a bluish color whence it is also termed "blue earth." From the presence of sharks teeth and other fossils in this blue earth, it is evident that the bed is of marine formation; while the dull and worn surface of the nodules of amber which it contains naturally leads to the supposition that the pieces of resin must have rolled about on the shore or washed by the sea before they became embedded in the sandy deposit. The amber beds belong to that Tertiary series which is known as the Oligocene, or formerly as Miocene.

The chief, if not the only, locality where amber is systematically worked by underground excavations, is at Palmnicken, in the peninsula of Samland, in eastern Prussia. The earth from these mines is brought to the surface and carefully washed, when the pieces of amber

are picked out and sorted for the market. At many points along the Pomeranian and Prussian shores of the Baltic, the amber is dug from the soil or picked from the cliffs. Sometimes the amber gatherers explore the face of the cliffs in boats and detach the amber by means of long poles. Others again merely collect the pieces which are cast ashore by the sea. The waves beating upon the cliffs, or tearing up the deep seated beds, wash out the masses of amber. After a storm detached nodules are heaved to the surface and floated to the shore. The amber-fishers, clad in leathern dresses, wade into the sea and fish for the amber with nets, or pick it from among the stones on the margin of the shore, just beneath the sea level, while in deeper water, they obtain it by diving or dredging.

Most of the rough amber finds its way to Danzig and Königsberg, where the trade is almost entirely in the hands of Jewish merchants. Some of the amber of commerce also comes from the western coast of Denmark and the substance is likewise found on the southeastern coast of Sicily and important deposits are known in the neighborhood of Bologna. It also occurs in the vicinity of the sulphur mines of Cesena, and has occasionally been found in Calicis, Silesia, Roumania, and elsewhere. Much of the Italian amber is remarkable for its beautiful opalescence or cloudy play of color. The color of amber is subject to considerable diversity, some varieties being of a pale primrose tint, or even quite white, while others present a deep reddish-brown color occasionally so dense as to appear nearly black. The variety most prized by the Orientals, who are great admirers of this material, is the straw-yellow amber, slightly clouded. Every Turk, however poor, strives to get an amber mouth-piece, not only because the substance is beautiful in itself, but on account of the popular notion that it is incapable of transmitting infection, a point of some importance with people, who hold it a mark of friendship to pass the pipe from mouth to mouth.

Amber has been a favorite material for ornamental purposes from a very early period. Homer makes no mention of any gem in his minute description of various jewels, save the amber which decorated the gold necklaces offered by the Phœnician trader to the Queen of Syria. It was one of the seven sages of Greece,

Thales of Miletus, who discovered the remarkable property which amber possesses, when rubbed, of attracting light bodies. This is the very oldest experiment recorded in the annals of electrical science. Indeed the word "electricity", comes from the word "electron", the Greek name of amber. Possibly the word "electron" itself had reference to the characteristic yellow color of amber, for it is noticeable that a pale yellow alloy of gold and silver was also called electron. As to our own modern word "amber", it comes, like so many of our scientific words, from an Arab source.

By the Romans, amber was so highly prized that Pliny tells us a small figure carved from this substance would fetch in

his day, more than a healthy slave. Roman ladies at one period were in the habit of carrying a ball of amber in the hand, for the sake of the delicate balsamic odor which it emitted when warmed in this way.

It is curious to reflect how so trivial a substance as the fossil resin of the Tertiary pine forests became in this way, means of opening up, at a very remote period, important lines of commerce between the north and south of Europe, and by thus bringing distant peoples into relation with each other, assisted in dispersing a knowledge of the arts of life over a vast area. A piece of amber, in short, became a powerful factor in the early history of European civilization.

COLLECTOR'S KINKS

Collectors are cordially invited to submit notes from their experiences and so make this department of interest to all.

Those collectors who make a specialty of visiting localities, whether frequently or occasionally, should have their collecting equipment all packed up and ready at a moment's notice. I use an old army gas-mask bag (obtainable at an Army and Navy store) in which is stored away hammer, knife, magnifying glass, notebook and pencil, 2 chisels, streak plate, blue and a yellow keel (lumber crayons), a number of small cloth bags (old salt bags), tissue and newspapers, wads of cotton, and string. A small tin box is also present which contains simple First-Aid material as tincture of iodine, small bandages, adhesive tape, cotton, needle and some pins. Another small tin box containing a tiny bottle of dilute hydrochloric acid (securely packed) is also available.

—A collector.

On a large construction job, part of which was the building of a three mile road through virgin country, I made friends with a pipe foreman to collect geological specimens for me. What I specially desired were those specimens

containing faults which I knew to be present. I showed him a typical specimen, explained what was wanted, and offered to give him a can of Prince Albert for every specimen collected.

The foreman's duty was to supervise the laying of a water-pipe line for the steam shovel and thus he had to traverse the entire stretch of ground and often through that part where the blasted rock was the thickest. In laying the pipe, all he had to do was to look around casually and if he saw a promising-looking rock, pick it up and examine it. If a fault was present, it was to be laid alongside the pipe line, a chalk mark made on the pipe indicating its location, and later, when I would be in the neighborhood, he was to get it for me.

I must have given over 50 cans of Prince Albert that summer and the specimens obtained were well worth the price of the cans. For some unusually fine specimens, I would give two or even three cans. And the foreman was as much pleased with his end of the bargain as I was with mine for all that season he was well supplied with tobacco.

—A rock collector.

Minerals as Souvenirs

— By —

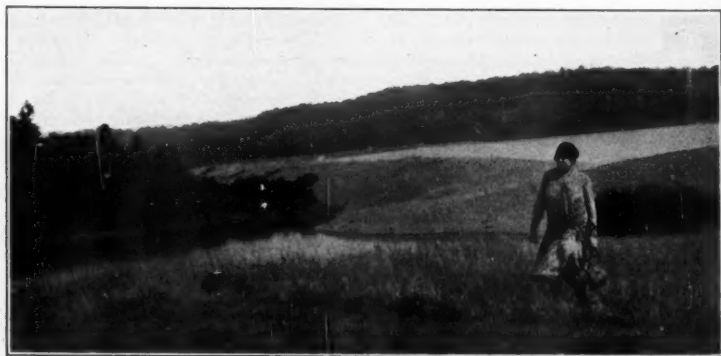
ERWIN FREDERICK GROSS, LL. B.

164 Montague St., Brooklyn, N. Y.

On our occasional vacation auto trips my wife loves nothing better than to gather up in somewhat regardless quantity chance pieces of pottery or attractive and oddly shaped baskets or silly pieces of linen and lace as mementoes of the journey. Now my taste—and fortunately our uncomplaining car minds neither bulk nor burden—runs to more weighty and substantial things, a chunk of rock or a canvass bag full of pebbles or the messy spoils of a quarry. These are my favorite souvenirs and, as any mineral collector will agree, they have the advantage of being less expensive and, except for a mere point of view, quite as decorative as the other artificial nicknacks.

In the late months of the summer of 1930 we took the road and, after a number of stops, spent a few days at Bar Harbor, Maine. Mount Desert Island of which Bar Harbor is the principal town, is a delightful surprise for anyone having a car to ramble over its length and breadth and to enjoy its wealth of woodland, mountain and marine scenery and everywhere perfect road-bed to speed over. Granite are its high cliffs and nowhere is the "stern and rockbound coast" of New England better typified. The

rolled pebbles of pink granite along the ocean front are especially attractive when moistened by the waves. At this lovely resort we heard by chance of a jasper pebble beach in the neighborhood of Machias, Maine, and as it was on our way, destined for Nova Scotia as we were, we took pains to find the place. In case some reader of this article should be interested, you find the road out of Machias to Machias Port and there make inquiries for the road to Starboard. At this place, in a cove almost at the ocean-entrance of Machias Bay, will be found this Jasper Beach, and it is locally so known. It is a most interesting spot, for as the waves wash up on the rather steeply sloping shore and the receding surge carries the pebbles seaward, you hear a strange noise which must be somewhat similar to that of the well known "singing beaches" of certain places abroad. Millions of dark brown, striped jasper pebbles of all sizes are strewn over a wide area and if one thinks enough of so humble a member of the quartz family, one can collect any quantity of the specimens. My wife and I found, besides, several brick-red and yellow jaspers and some having streaks of green—



Jasper Beach

epidote, probably. Personally I have always had a sentimental liking for jasper on account of the beautiful thought the ancients had about it. They believed that it stood for "wisdom" and "courage", certainly the two finest of virtues.

After passing over the boundary into Canada at Calais and sojourning at St. John, New Brunswick, and then crossing the Bay of Fundy on the new and roomy steamer "Princess Helene" to Digby, Nova Scotia, and from thence traveling down "the French shore" to Yarmouth and again up along the Atlantic Ocean to Halifax, we motored westward to the Evangeline Country and found quarters at Wolfville, N. S. Here is something new and unusual for the tourist. Besides the entertaining relics and memorials of the Acadians, so beautifully pictured in Longfellow's immortal poem, the country itself is full of interest and yielded up many a beautiful and unique scene to my faithful camera. The soil is a dark red, showing the erosion of the underlying red sandstone and every stream and river gives evidence of the enormous tides for which the Bay of Fundy is so justly famous. At Wolfville and other places along Minas Basin, an upper portion of

Fundy, these tides often attain a height of fifty-four feet and more, greater or less according to the time of the year, the moon and other pertinent factors.

"West and south there were fields of flax, and orchards and corn fields

"Spreading afar and unfenced o'er the plain; and away to the northward

"Blomidon rose, and the forests old, and aloft on the mountains

"Sea-fogs pitched their tents, and mists from the mighty Atlantic

"Looked on the happy valley, but ne'er from their station descended.

"There, in the midst of its farms, reposed the Acadian village."

Longfellow's *Evangeline*.

Not far from Wolfville, at the foot of Cape Blomidon, there is a locality well-known to mineral collectors. Here, at Amethyst Cove, beautiful specimens of the lilac colored amethyst are found; also jasper, agate and other varieties of quartz, obtainable more commonly in the springtime, after winter storms have battered away and loosed these minerals out of the ledges of red sandstone of which the six hundred feet height of Mt. Blomidon is composed. Cape Blomidon is the jutting out end of Blomidon Mountain,



Statue of Evangeline and Site of Ancient Grand Pre

which protrudes into the Bay of Fundy and, with Cape Split opposite, cuts off the main body of the Bay of Fundy and forms what is known as Minas Basin. Grand Pre, the legendary home of Evangeline, was on the shore of Minas Basin and some of the gnarled willows, now hoary with age and planted over three hundred years ago by these hardy Acadians, who from far off Normandy brought their few chattels, their manners and customs, over the fierce wastes of the Atlantic and up through the Bay of Fundy, past Cape Blomidon and into the body of water which some early Portuguese navigators named Minas Basin, are still standing, living markers of the site of this ancient settlement.

There is a passably good automobile road from Wolfville to the very foot of Cape Blomidon. Unfortunately the tide had begun to come in when we arrived and we had not the time to walk along the cliff-base to distant Amethyst Cove. A fifty foot tide of compelling moisture forms somewhat of a damper to one's mineralogical ardor, so we ventured only a half mile or so, but, nevertheless brought back some jasper and a fine large specimen of Nova Scotia gypsum which had weathered out of the cliff. From a nearby dweller we were fortunate in be-

ing able to purchase at small cost a good specimen of the local amethyst. The latter shows at its base a wavy layer of chalcidony and in addition, a thin coating of cacholong.

All throughout Nova Scotia and even in St. John N. B. the jeweler's show-windows displayed cut amethysts advertised as "Nova Scotia amethyst", meaning the Blomidon kind, but I fear they had more the color and cut of those issuing in such abundance out of Oberstein and Idar, Germany.

Along the shores of Minas Basin and especially in the neighboring Annapolis Valley are grown great harvests of the famous Gravenstein apple, a fruit of distinction, but one better known in the markets of Great Britain where most of them find their way.

We liked our jaunt into the Maritime Provinces and I can best bring back those interesting scenes of wide, red river-beds, hulls of ships resting dry and teetery in the sand abandoned completely by their watery element, vast tides and high wharves, ox-drawn carts and large and flourishing apple orchards by simply looking at and reflecting upon one of the mineral specimens that I brought away, a genuine and worthwhile souvenir of the place visited.



CAPE BLOMIDON

The Treatment of Gem Stones by Heat

—By—

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The "burning" of Agates, as it was practiced by the agate cutters, led to the discovery of changes in color through the effect of heat upon certain precious stones. While the former process is one of chemical disintegration, oxidation, etc., the heat treatment of precious stones produces certain changes within the molecular structure of the minerals, the cause and nature of which are not explicable at the present time, at least, no fitting explanation has been forwarded up to now.

Until very recently, the heating of gem stones was practiced in a crude and inefficient manner; the stones were generally placed into fine, dry sand and heated in a crucible over either the fire in a stove or in an old fashioned muffle furnace. No records of temperature were taken and no attempts were ever made to place a thermometer alongside the stones as it was a firm belief that the crucible must be entirely covered and not the slightest opening should exist to permit the "entrance of air" into it. In talking with various old timers, the author found that it is the general belief that there is no air within the crucible because it is entirely filled with sand and tightly covered. The meaning of a vacuum is somewhat strange to these people who are not accustomed to thinking in physical terms.

Altogether, the burning was a delicate enterprise and often resulted in failure by over or underheating if not partly or completely cracking the stone which was to be augmented in value. There were, of course, some men with long experience who took certain precautions which insured them a higher success than the beginner could ever hope to achieve.

The old methods have now given way

entirely to the efficient and clean way of heating the stones in an electric furnace where temperatures may be measured exactly and records taken of what is going on within. Over and underheating can be prevented, though the average lapidary in Europe still refuses to rely on exact measuring instruments and safety devices but rather trust his "feel" or "luck" than to tabulate time and temperature. When the methods of burning, now commonly in use, were developed in the laboratory of the author and suggested to various important cutters of precious stones, most of them refused to use thermocouples, (to be described later on) and employed instead the cheaper glass thermometers which often broke and registered wrongly by mishandling, jeopardizing the entire lot of stones to be treated; not considering the fact that a dozen of broken thermometers cost the same amount as an electrical measuring device which would never fail and could not deteriorate under any treatment no matter how rough or unskilled. It is also a curious fact that while thousands of dollars worth of stones are yearly ruined by overheating up to now no lapidary as yet has installed the very simple safety device suggested by the Institute for Precious Stone Research. This is an additional thermometer with contacts at certain points of the scale whereby an electric current is closed by the rising mercury shutting off the feeding current of the furnace or ringing a warning bell.

The temperatures at which the changes of color take place range from 350 to 650 degrees centigrade (662 to 1202 Fahrenheit) and the ordinary chromium-nickel wound electric furnaces can be used as they give working temperatures up to 850 C. We will not describe the construction of these furnaces as the necessary information can be easily obtained

*Institute for Precious Stone Research.

from catalogs and handbooks. The regulation of the heat is effected by rheostates or mercury regulators and the various devices permit a keeping of constant temperatures for a length of time. This is very important as the success of the burning process depends on an efficient drying, at about 200 C. (392 F.) over a period of several hours and a slow increase of temperature. It is also advisable to regulate the temperatures in such a manner as to intercept the rising periods by keeping certain points constant for lapses of half an hour to an hour and even by letting the temperature drop from 50 to 100 points several times before the final critical temperature is reached. This relieves internal stresses and very often prevents a cracking of the stones. This up and down manipulation is advisable when about 300 degrees C. are reached (572F) as this is the dangerous point for cracking. When a stone survives this point there is less danger of cracking at higher temperatures.

The heating does not necessarily have to take place within an electrically heated furnace as the old fashioned gas furnace will do just as well, though the temperatures cannot be regulated as easily as

with electric furnaces. Difficulties arise when the temperature needs to be kept at a constant level over a longer period as the pressure of the gas is apt to vary greatly and with it the heating effect.

It has been aforesaid that it was the belief that all air had to be kept away from the stones while they were either hot or being treated. For this purpose the old methods resorted to immersing the stones in sand to prevent sudden cold drafts of air striking the stones in case the cover of the crucible was to be lifted. Such an admission of cold air would naturally endanger the hot stones and no one would seriously think of plunging them from the hot crucible into the air of the room; however, it must not be believed that the openings and cracks which are found with electric furnaces do the slightest harm either during or after the burning process. While the furnace is hot no air can enter from the outside except by degrees which effect a slow cooling of the muffle. There is no danger at all to burn the stones either by placing them on the bottom of the muffle or on racks in case a number of them are being treated. It is advisable, however, to always place the stones upon a low rack which can be easily made by

We are giving here a list of gem stones which are not affected by heat and following up with a list of pyro gems.

Gems Not Turned by Heat

Ruby, Australian Sapphire, Spinel, Emerald, Chrysoberyl, Peridot, Garnet, Kunzite.

Gems Changed by Heat

	Color Produced	Temperature (C).
Blue Ceylon Sapphire	faint yellow-white	400
Purple Ceylon Sapphire	pink	450
Precious Topaz (orange)	pink	500
Green Beryl	blue (aquamarine)	420
Yellow Beryl	light blue-white	400
Dark Red Tourmaline	pink	550-600
Blue Green Tourmaline	clearer green	650
Smoky Green Tourmaline	clearer green	600-650
Smoky Quartz	white	275-300
Smoky Yellow Crystal	yellow-orange	250-350
Certain Amethysts	orange-yellow	500-575
Salmon-colored Beryls	clear pink (Morganite)	400
Brownish Beryl	pink	400
Zircon-green-blue	clear blue	380-500

bending over the corners of an iron sheet so as to serve as feet. Direct contact with the bottom of the muffle, which may at times heat up unhomogeneously, might at times harm the stones or convey the temperature of the heating coil too fast. If supported on a rack they are gradually heated as the muffle gains in temperature. The door of the muffle should never be opened suddenly but, while cooling the furnace, it does not hurt to open it slightly to shorten the period of cooling, as a cooling time extending over two hours suffices to guarantee safely against cracking. The stones should not be taken out of the furnace before the temperature has dropped to 80 C. (176 F.).

It must be remembered that the temperature of the muffle is lower near the door and near the back wall. It is, therefore, well to use only the inner part of the muffle and to keep away from the door at least by two inches. The difference is generally about 20 degrees C. or (68 F.) when the temperature of the inner part is near 500 C. (900 F.).

In case it is desired to watch the stones while they are being treated it is possible to construct a window of fused, transparent quartz (quartzglass) or Pyrex glass; the muffle can then be illuminated by a flash light from time to time. It is well to keep an additional cover of asbestos over the window to prevent losses of heat.

The control of temperature can be easily effected by mercury thermometers which are inexpensive and register up to 555 C (1022 F.) They break easily, however, and where funds permit the purchase of an electric measuring device, described below, the thermometers should not be used. When green tourmalines, requiring 650 C., are being burned and no thermoelectric device is at hand, the burning can still be done with a great degree of safety as the stones are not easily overburned and are generally "done" when they exhibit a cherry-red color. This is, however, not the case with pink tourmalines as they are easily ruined and turn colorless if the temperature is raised to 10 degrees above the critical point. With such sensitive stones it is indispensable to have accurate instruments for recording temperature in order to prevent losses in the long run.

Measuring temperature by the thermoelectric principle is the safest and most modern way of obtaining information

about the exact heat of the inside of the muffle. The method is based on the fact that any two dissimilar metals fused together at one point will produce an electric current at the cold terminals. This electro-motoric force can be measured with a sensitive instrument such as a Galvanometer or a Millivolt Meter and the difference in potential of the two cold ends of such welded wires is proportional to the temperature at the hot ends. A scale can be easily calibrated to permit a direct reading of the temperatures within the heated muffle and the instrument permits to place the fused point right next to the object the temperature of which is to be obtained.

There are various combinations of metals producing currents of varying strength. The most satisfactory couple for the range of temperature required by our work is a combination of Iron and Constantan which produces about 35 Milli Volts at the maximum temperature used in the burning process. Such thermocouples are manufactured, i. e. by the Brown Instrument Company of Philadelphia, Penn., and by such firms as Arnoux freres of Paris, France and W. C. Heraeus of Hanau, Germany. The Brown Instrument Company also sells the necessary standard wires for making suitable couples for special use. Two such wires of about 25 inches in length, fused at one point, and one wire covered with pieces of glass tubing to insulate against the other one, make a serviceable thermocouple for the purpose of measuring heat within small furnaces. It is advisable to wrap some asbestos cord around both wires in order to keep them together and to insulate the unprotected one against the metal of the furnace. The two cold points should carry heavy binding posts, soldered on, and the connection between them and the instrument should be made with not too thin wires. The wires of the thermocouple should be about 1-16 inch thick, though this does not matter much. Such a couple can be calibrated by using the following temperature points and plotting a curve on sectional paper.

Boiling Water	100 C.	212 F.
Molten Lead	327	621
Molten Zinc	419	787
Molten Aluminum	659	1218

A scale thus obtained on a Galvanometer is sufficiently accurate for ordinary work. The electro-motoric force pro-

duced by the described combination increases with temperature as follows:—

Fahrenheit	Millivolt
100	1
200	4
300	7
400	10
500	13
600	17
650	18
700	20
800	23
900	26
1000	28
1100	32
1200	35

In order to burn a few smaller stones or just one single stone, a method is employed in our laboratory which is simple enough to be followed easily and without trouble by anyone. We employ a tube of suitable width (about 1 inch) made out of transparent quartzglass with ends fused on of vitreous, opaque Silica. This tube withstands all sudden changes of temperature and permits the process to be followed by the eye. The tube can be supported on two forked stands or hung from a stand on two looped wires. One end is closed by a cork; the other end can be left open or closed by a cork with a hole in it large enough to introduce the thermometer or wire couple. The stone is placed into the center part of the tube, which is transparent, and is held in place by some glass wool, which is inexpensive. The point of the thermocouple is placed right next to the stone. This is the best arrangement for burning pink Tourmalines and precious Topazes. It serves ideally for experimental work and for burning all single stones. In starting to heat this tubular furnace, it should be brushed with the flame of an alcohol or bunsen burner (blue flame) in order to heat it gently at the beginning. After having heated the stone to about 200 C., for one half hour, with both ends of the tube open, the increase of heat should be so regulated that an hour is spent in bringing the temperature up to 650 degrees C. There is no necessity to cool off this arrangement in the flame and after the effect is obtained the tube can be left to itself to cool. If, however, a glass tube such as is used by chemists for analytical work is employed, it is advisable to cool off slowly over the

flame so as to avoid breaking of the tube; besides, the heating should be started with more precaution as a cracking tube will plunge the stone into the cold air of the room.

It remains now to be considered if any variations in the application of heat would tend to influence the final effect of the process. Such varying effects can be noticed with most all colloidal substances and inasmuch as the color of precious stones was, until recently, believed to be more or less of colloidal nature it was worth while and even necessary to make tests in this direction in order to detect possible deviations from the ordinary effect and to test the colloidal theory. It was also important to make several tests to find a possible effect of various gases surrounding the stones while under the influence of heat.

While there can be no definite answer as to the state of dispersion of pigmenting bodies (mostly metals) prevalent in precious stones, it was established that in no case the conclusion could be towards a colloidal viewpoint. A certain, though misleading, similarity exists between the behavior of stones of certain glasses but this matter does not enter the subject of this article.

It has been found in the course of investigations that a prolongation of the heating at certain points below and at the critical point of change does not effect the resulting color. The stone is at all times either underheated or overheated and additional time of application of heat below the critical temperature will in no case produce the same effect as several seconds of critical heat energy acting upon the stone. Therefore, the effect is purely one of gradation. A sudden change seems to take place within the crystal structure of the stone whereby the atomic arrangement is readjusted to new conditions and one such change, closely connected with the change of color, is well-known to take place with quartz which turns from a variety called Betha Quartz to another variety called Alpha Quartz. X-ray photographs make visible the sudden jumping and rearranging of the atoms from a hexagonal arrangement to a trigonal system and at precisely this critical temperature, 575 C., the change of color takes place when Amethysts are heated to be turned into Topas. The author intentionally writes the word Topas terminating with an "s" in order to

distinguish the word from precious Topaz which is a different mineral. There has been a tendency to abolish the trade name of Topas for the Quartz variety and to adopt the word only for the precious Topaz. However, it can be readily foreseen that an agreement reached on the green table will have no effect on the customary use of the word as the average dealer in stones and the jeweler will handle a thousand Topases of the Quartz variety before they handle one of the precious species. It is therefore useless to establish rules which would not be followed and the only means of distinguishing between the two stones would be to call one a Topas, written with an s and to call the other kind a precious Topaz. There is very little doubt left that the atomic structure of the material has something to do with its color and certain Amethysts will never show the maximum depth and brightness of color if heated below this point, though they may also exhibit a yellow color which develops during the cooling of the stone.

Most Beryls exhibit this tendency very similar to Amethysts and the highest depth of color is reached when the temperature has dropped to about 300 C. There might be intermediate colorless stages when heating and also during the cooling; in case the temperature has not been driven high enough to produce the desired effect the whole process can be repeated and the stone will show the desired color after the second treatment, provided the critical temperature has been reached.

Experiments with gases and vacuum carried on in the laboratory of the author have shown that these have no effect on the final color at least not within the comparatively short periods at which they were permitted to act. Some previous publications along these lines must therefore be read with caution, especially as the results are very vaguely described and exact indications of temperature are

missing. All stones listed before were treated in vacuum and with a number of common gases and in no case a deviation from the effect noticed when heated in air were recorded. This was especially remarkable with green Tourmaline where we would expect to get different results. The oxidizing and reducing effects of Oxygen and Hydrogen has, therefore, to be considered to be zero though a certain influence may be found when stones are heated over a very long period at constant temperature. Such experiments have not been carried on up to now.

It may be stated here that the author has filed an application for a patent covering a method to burn stones in complete vacuum with a view to rid the stones of the last traces of moisture and included gases (mechanically and molecularly included) so as to prevent a cracking of even flawed stones which generally do not withstand the effect of higher temperatures but break apart at 300-350 C. It has been possible to heat stones with this method which would ordinarily be unsaleable on account of their undesired color. Almost 100% of even badly cracked and flawed stones could be saved.

In finishing this article it may be stated that while the devices described will help greatly to prevent losses and to make the burning process a practical one, it requires a certain amount of technique to obtain the best results. It must always be kept in mind that the critical temperatures given are average ones but that certain kinds of Quartzes exist which will turn at lower points; the same is the case with Beryls and it is well to make tests before entrusting a large lot of stones to the heat of a furnace. The tube of quartz glass will come in very handy for such experiments and will at the same time serve to familiarize the lapidary with the phenomenon more than would be the case if he were only to observe the final effect and not the intermediary stages.

The scale of hardness universally accepted among lapidaries and mineralogists is as follows with brief, rough description of what each means:

1. Talc; easily scratched with thumb-nail.
2. Gypsum; easily cut with knife.
3. Calcite; less easily cut with knife.
4. Fluorite; can be cut with difficulty.

5. Apatite; can be cut with extreme difficulty.
6. Feldspar; can be scratched but not cut.
7. Quartz; can not be cut—will scratch glass.
8. Topaz; will scratch quartz.
9. Sapphire; will scratch topaz.
10. Diamond; will scratch sapphire.

The Fluorite Deposits of Southern Illinois and Kentucky

—By—

FREDERICK H. POUGH

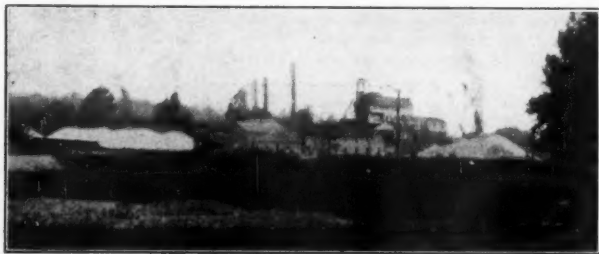
The fluorite deposits of Hardin and Pope Counties in Illinois, together with those of Crittenden County, Kentucky, are, economically, the most important deposits of that mineral in the country. In the year 1930, the United States produced 95,849 short tons of fluorspar, of which a total of 83,315 short tons came from Illinois and Kentucky. The remainder was produced in Colorado and New Mexico to supply local demands. The most important use of fluorite is as a flux for the production of steel in the open hearth furnace. Other important consumers are the manufacturers of hydrofluoric acid, opalescent glass, and aluminum.

The presence of fluorite in commercial deposits in this region has been known for nearly a hundred years, and it has been consistently mined for over half of that period. There are three distinct types of deposits found in the Rosiclare district and all have produced important amounts of the spar. The most common type is the fault fissure vein. This is by far the most important economically, by reason of its more abundant occurrence and also by its continuity at depth. One of the deepest mines at Rosiclare is down to 550 feet and as yet has found no signs

of a diminishing ore body nor an increasing gangue. The vein in this mine has a maximum width of 30 feet and averages about 12 feet. The fluorspar is very pure with calcite as the only important gangue mineral.

A second type of deposit, which is locally of great economic importance, but which is only to be found at a single locality, is a bedded replacement ore body. This is found near Cave-in-Rock, Illinois, and originated through replacement of a limestone bed by fluorspar. It seems probable that the mineralizing solutions mushroomed out into the St. Genevieve limestone and replaced it, when they found themselves unable to pass through the overlying Rosiclare sandstone. Shrinkage during this process is probably responsible for the many small open spaces lined with fluorite crystals, which are found in this deposit.

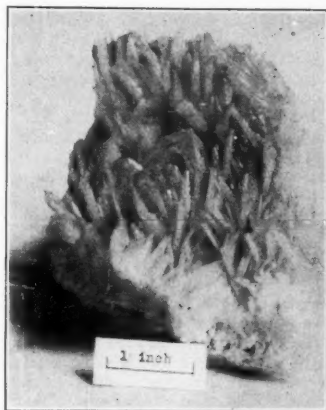
The third type is of minor importance and consists of isolated pockets in limestone. When worked these are rapidly exhausted and at present there are no mines of this type in operation. They are similar in origin to the second type but cover a smaller area, and should likewise produce good specimens when they are worked.



Workings of Rosiclare Lead and Fluorspar Mining Co., at Rosiclare, Hardin Co., Illinois.

The list of minerals from this region is comparatively long and quite interesting. Fluorite in fine crystals is of course, the outstanding one. Barite is occasionally found in beautiful brilliant white crystals, but it is not common. Calcite is abundant and occurs in several types of crystals, with the scalenohedron the most common form, and in many shades. Galena is often found associated with the fluorite and sphalerite is likewise occasionally to be found. Greenockite is a rarer mineral which is found in a few of the vein-type mines on both sides of the Ohio river, always occurring as a yellow coating in fissures in the fluorite-sphalerite vein. Other minerals observed at different mines include malachite, chalcocopyrite, smithsonite, marcasite and limonite.

The fluorite crystals deserve a more complete description, for their many variations of color and form make a most interesting collection. The common and practically the only form is that of the cube (100) faces. Octahedral faces have been reported but the writer has never seen any, despite many trips to the different mines, and he has seen but one cube with small dodecahedral (110) faces. The tetrahedral face is likewise uncommon on these crystals. The plane faces, however, are very interestingly modified in many cases, by "built-up" corners and edges, that is, prismatic growths of varying thicknesses scattered over the faces of the cube and oriented parallel to those faces. They may occur



Group of Barite Crystals

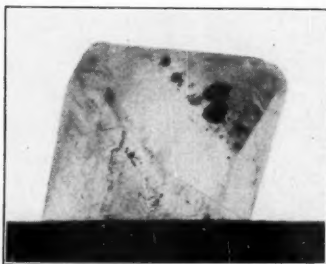
only on the corners or edges and they may form smaller plateaus further toward the center of the cube face. They are usually of a different color than the rest of the cube, commonly a dark purple. The crystals seldom have bright faces, but are usually quite dull. Other crystals seem to be composed of a series of small parallel arranged cubes, building up a pyramidal mass. A few of the crystals show etching, which may range all the way from a slight dulling of the luster to the creation of a distinct hole where water appears to have dripped upon the crystal.

A second interesting feature is their color and color banding. In color, the fluorite ranges from colorless to white, yellow, amber, light green, blue and purple, and frequently one crystal will show two or more of these colors, arranged in bands parallel to the crystal growth. At Cave-in-Rock, the most common type is a light yellow with a deep purple surface coating; less often the later layers are a light blue. At Rosiclare the crystals are often light blue with a few thin bands of light purple. A mine in Kentucky yields a colorless cube with thin purple to rose-color bands. There are very few specimens which do not show some banding some of the massive crystalline vein material having broad and irregular bands of color running through it.

The third interesting feature are the inclusions within the crystals. Marcasite is quite abundant and is to be found in



Group of Large Crystals of Fluorite showing "Built Up" Portions



Cleavage Octahedron of Fluorite with
Oil and Gas Inclusions

small crystals in many of the fluorite crystals and masses. It may be scattered at random or arranged in planes parallel to the cubic faces. Where it has not been completely covered by later fluorite, the marcasite has altered to limonite. Oil is likewise occasionally found as inclusions in fluorite crystals, but it is comparatively rare in its occurrence. Still rarer are the air or gas inclusions which are associated with the oil. In an occasional specimen the bubble within the oil may be seen to move back and forth

within the oil drop as the specimen is tipped. Usually these are so small as to require a lens to be readily seen, but occasionally they are large enough to be quite easily visible to the naked eye. The writer likewise has in his collection one specimen of a cube containing several good-sized bubbles which move in a clear liquid, probably water. In this case the cavity is bounded by plane surfaces, but in the case of the petroliferous inclusions the shape is irregular.

In conclusion it might be well to say something regarding the genesis of these deposits. Nothing certain is known about this, but it seems extremely likely that they are closely related to the many igneous dykes which are to be found in the region. None of the mines has as yet cut any of these dykes with its workings, but it is possible that in extending them one may be intersected. There can be but little doubt that igneous activity is responsible for the presence of the fluorine, so it is obvious that there must be some genetical relationship.

Ref.: U. S. Geol. Survey Bulletin 255—
"The Fluorite Deposits of Southern Illinois," by H. Foster Bain.

PRELIMINARY ANNOUNCEMENT OF A ROCKS AND MINERALS ASSOCIATION OUTING TO BE HELD IN THE SUMMER OF 1932

A number of subscribers to *ROCKS AND MINERALS*, and particularly those who are amateur collectors, have expressed an interest in an Association outing to be held sometime during the coming summer. We believe the idea to be an excellent one as it would be the means of many subscribers becoming acquainted with one another and an opportunity also afforded for collecting specimens and examining rock formations. We also believe Peekskill would be the logical base for operations as in its immediate vicinity are two iron mines, two emery mines, a pyrrhotite mine, a limestone and a granite quarry; while within the city limits eight rock formations are ideally situated for examinations. It would be impossible to visit all of these occurrences but a number of the most interesting localities may be taken in.

A Sunday would no doubt be the day best suited for many and we are of the

opinion that June 19th or the 26th would be most appropriate as a definite announcement could appear in the June issue of *ROCKS AND MINERALS* (out about June 1st.) Time of outing from 9.00 A. M. to 6.00 P. M.

If the rock formations within the city limits are only to be visited, no means of transportation would be necessary but if the surrounding mines and quarries are to be visited then transportation must be provided. Were the majority of collectors to come in cars and each had room for one or two extra persons, then all could be taken care of nicely, otherwise a bus would have to be hired and a charge of \$1 be levied against each.

Those readers and subscribers who would be interested in the outing are requested to write in to the Editor at their earliest opportunity and state in particular what date would suit them better and would they come by car or train.

JET

—By—

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Of all rocks and minerals used for ornamental purposes, perhaps jet is the most surprising, as it is a mineralized vegetable material, i.e. coal, probably the last substance one would expect to be used in such a way.

It belongs to the class of brown coals or lignites and behaves like the coals, in that it will burn (though not very readily) and on heating emits gas—100 gms. of jet were found to evolve 30.2 cc. of gas at 100°C., the gas consisting of 10.93% carbon monoxide, 86.9% quartzane or ethane, and 2.17% nitrogen. The composition of the gas evolved thus suggests an organic origin, and this is confirmed by microscopic examination, for although many pieces of jet show no traces of organic structure, yet specimens examined as long ago as 1834 by Professor Nicol showed the characteristic structure of coniferous woods and were referred by him to pines and araucaria.

There is, however, much difference of opinion as to what jet really is, some maintaining that there is no trace of organic structure (indeed many specimens fail to show it), others regarding it as fossilized wood, traces of which, as has been stated, can be detected in some specimens, and there are some who incline to the view that while of vegetable origin, jet was formed by vegetable matter being first converted into fluid bitumen and eventually consolidated to jet, but that in the process there was no intermediate state of lignite.

Jet occurs in a number of places where brown coals occur, the best known localities being near Whitby on the Yorkshire coast (England), Spain, the Department of Aude in France, Wurttemberg, Bohemia, and in North America in the southern part of Colorado, at Wet Mountain Valley and in El Paso County, and at Picou in Nova Scotia.

The quality varies considerably, but it is acknowledged universally that the

best comes from Whitby, though not all Whitby jet is first quality. The qualities required in good jet are a hardness of 3-4, specific gravity 1.35, compact dense homogeneous material, expressed by a perfect conchoidal fracture, and a uniform dense black color. There must be no foreign material present such as iron pyrites. As the writer is best acquainted with the Whitby area, it is to this that the following remarks mainly apply.

In early times jet was collected in the same way that much of the amber of the Baltic Provinces is still obtained, that is, by picking up drift pieces from the sea shore, but at Whitby this source of supply was soon exhausted. It is now necessary for the workers to mine the cliffs, which run to 600 feet high, and inland escarpments.

It is extremely difficult to find how many miners are now employed as the occupation is a seasonal one and the excavations are so small that they do not come under the regulations of the British Mines Acts and no returns are required by law. Also much inferior jet from France and Spain is imported into Whitby and worked and sold as Whitby jet, and it is very probable that in some years, at any rate, none of the jet cut in Whitby is of local origin.

However, the remains of the old jet holes are very numerous both in the cliffs near Whitby and inland, so that the line formed by the workings indicates very clearly the outcrop of the "jet-rock" as it is called. This jet-rock, only a small part of which is jet, forms the lower third of that zone of the Upper Lias which is characterized by the presence of the ammonite *Harpoceras serpentinum*. The upper two-thirds of the *serpentinum* zone consists of dark shales with pyritous doggers (nodules) while the succession (taken from the Memoirs of the Geological Survey of the United Kingdom—"Jurassic Rocks of Yorkshire")

p. 128) in the jet-rock proper is as follows:—

5. Solid band of hard indurated shale which weathers out on the shore into large tabular doggers. This bed forms the roof of the jet workings. 1 foot

4. Hard dark shale 5 ft. 3 in.

3. Line of large irregular doggers; same distance apart.

2. Shales with several rows of small doggers; forms the lower part of the jet workings. 9 feet

1. Hard dark laminated shales with the ammonite *Harpoceras elegans* and the lamellibranch *Posidonomya bronni*. 8 feet

As I have said, the jet proper forms only a small part of the jet-rock and occurs as isolated lumps distributed very irregularly, so that the mining has always been a rather precarious occupation. The lumps of jet vary in size and in the cliff face were obtained by a process called "dessing" which consisted in hewing the cliff sides until a piece of jet was exposed when the seam was followed until exhausted. The method inland and sometimes in the cliffs was by drifts in the hillside which, however, were quite short—rarely more than 300 feet long.

In 1847 a seam of jet weighing over two tons (actually 5,180 lbs.) and valued at £250* a ton was obtained, but it must be realized that much of this would be of poor quality and discarded. The largest piece of solid good jet ever found is stated to have been 6 feet 4 inches long, 5 inches wide, and 1½ inches thick, and to have weighed 11½ lbs. It was offered to the British Museum for £10.10s. Od. and afterwards sold for £15.15s. Od. The highest price ever paid for a piece of jet from the Whitby district was £21 for a piece weighing 21 lbs.

Rough jet is covered by a skin which is blue in the cliffs and brown inland. This skin is removed by chipping with a large chisel, and the trimmed pieces are sawn into convenient sizes, after which they are carved or ground into the required shape. Lathes are employed in cutting certain forms and the polishing was originally carried out by means of oil and rouge. Now, however, rottenstone and lamp-black are usually employed, leather and walrus hide being brought into service. Faceted beads are always cut and polished in the hands.

Polished jet has been much used for altar frontals and similar ornamental

work, on account of the curious property which it possesses of assuming colors of adjacent objects, so that for example, a cabochon of jet on a red ground appears to glow red like a garnet. No other black ornamental stone behaves in this manner.

On account of the high price and the comparatively brittleness and softness of jet, the industry has declined. This has been hastened by the fact that cheaper substitutes such as steel, glass, chalcodony artificially stained black ("onyx") and hematite have also come into competition with it.

Jet can be distinguished from its substitutes by the fact that it is warm to the touch on account of its poor conductivity of heat, whereas the other substances feel cold when handled.

In 1873 there were 200 workshops employing 1,500 hands and realizing a trade of £90,000 per annum, but by 1888 not more than £200 worth of Whitby jet was employed owing to the importation of French and Spanish jet which is inferior in quality and unable to withstand the same extremes of heat and cold. Now, probably very little of the jet cut at Whitby is from the local mines, and there are now only 30 workers engaged in the industry.

Many articles are made from jet among which may be mentioned brooches, bracelets, necklaces, cross-shaped pendants, beads and rosaries, snuff-boxes, candlesticks, walking-stick handles, inkstands, and hour-glass stands. It may be interesting to note here that some of the anthracite of Pennsylvania may be treated similarly to jet. I have in my possession buttons of anthracite inlaid with iron pyrites.

That jet was known to and appreciated by the ancients both in England and elsewhere, is proved by the fact that ornaments of jet have been found with Palaeolithic remains in Switzerland, in Celtic barrows, and Roman coffins. It was probably thought to have protective virtues and used as a talisman like amber. According to Pepper, jet was one of the materials employed by the Pueblo Indians in the making of amulets, a fine figure of a frog in jet being found by him in 1896 at Pueblo Bonito.

Whitby jet is referred to by the Roman Solinus and the Saxon chronicler Bede, whilst the earliest English (Saxon) poet who died about 670 A. D. and was

buried at Whitby Abbey refers to jet in these lines:—

"Jetstone, almost a gemm, the Lybians find
But faithful Britain sends us wondrous kind;
'Tis black and shiny, smooth and ever light;
'Twill draw up straws, if rubbed till hot and bright;
Oyl makes it cold, but water gives it heat."

In the Whitby Abbey rolls of 1394, jet is again referred to:—

"Itm. p. vij anulis Robo Car de gagate

vij d." (To Robert Carr, seven pence for seven rings of jet.)

and there is no doubt that it was much used before the disestablishment of the Abbey for the making of rosaries and crucifixes. During this time and up to the time of the Tudor sovereigns, the loose pieces from the cliffs collected on the shore were the main source of supply of the jet and it was not until the beginning of the Nineteenth Century that excavation was carried on to any great extent. The first workshop for jet is said to have been opened by one J. Carter in 1808.

*(A £ was worth approximately \$5.00)

A Reconstructed Museum Specimen

—By—

EDWARD C. FOSTER

There has been prepared at the Clark University Geological Laboratory, Worcester, Mass., an interesting and instructive museum specimen, showing the arrangement of tourmaline crystals in pegmatite.

A block of coarse pegmatite was obtained from Mt. Mica, Maine, taken into the laboratory and with the use of a cold chisel, hammer, glue and a little patience a really remarkable specimen was obtained. The pegmatite was first split in half—the lower half being used for the base—one might almost say as a natural background. The other half was then subjected to the chisel and hammer. The smallest bits of quartz and feldspar were thus cut from the tourmaline crystals.

These crystals, broken to be sure, were carefully set aside and matched up. After the pegmatitic material had been broken off and the various pieces of tourmaline were matched up—they were glued together and were finally matched with those tourmaline sections remaining in the unbroken half of the pegmatite. The resulting specimen showed a remarkable "growth" of various sizes of crystals. These crystals ranged in size from $\frac{1}{8}$ to $\frac{3}{4}$ of an inch in diameter, and from two to six inches in length. A veritable network of crystals is shown, and will undoubtedly prove of interest to classes of geology, and especially to classes of mineralogy.

The variety of the tourmaline is the common, black, schorl variety; the pegmatite is very coarse, made up almost entirely of quartz and feldspar with very little mica present. Anyone may, who has the patience and the material, reconstruct such a specimen. It is showy and deserving of space in any mineral cabinet.



The Reconstructed Specimen

Spodumene

— By —

EUGENE W. BLANK,

State College, Pa.

Lithium was discovered in 1817 by Arfvedson while the latter was working in Berzelius's laboratory.* In the course of his work upon a petalite from Uto, Sweden, he discovered an alkali which was shown to differ from those already known in at least three important particulars: (1) in the insolubility of the carbonate; (2) in the low fusing points of the sulphate and chloride; and (3) in the hygroscopic character of the chloride. To the element was given the name Lithium from the Greek (*litheos*) meaning stony because it was believed at the time of its discovery that its presence was confined to the mineral kingdom. Since its discovery it has been found, however, not only in the mineral kingdom but in the animal and vegetable kingdoms as well.

Besides the characteristic mineral forms in which lithium has been found it is widely distributed throughout the world as salts of the metal. It occurs as a chloride in most spring waters and in sea water. A mineral spring at Wheal Clifford, near Redruth (Cornwall) contains 26 grains per gallon; a salt spring in the Huel Seton copper mines in Cornwall has been found to contain 34 grains per gallon. Lithium salts are found in most plants, especially in the leaves. The ash of tobacco has been found to contain 0.44% of lithium chloride. The presence of the salt in excess appears however to be generally injurious to plants. Lithium also occurs in all the organs of the body, particularly in the lungs.

R. Bunsen and A. Matthiessen prepared rather large quantities of metallic lithium as early as 1855, by the electrolysis of the fused chloride. The metal may also be obtained by heating a mixture of elementary calcium and lithium chloride in the presence of hydrogen.

Lithium is a true metallic element with a silvery-white luster and a melting point of 183°C. Its specific gravity is 0.59, the metal being light enough to float in petroleum. It decomposes water at ordinary temperatures with the evolution of hydrogen, but the gas does not ignite even if the water be boiling. Allowed to stand in the air the metal slowly oxidizes.

Most of the salts of lithium are easily soluble in water; the principal exceptions being the phosphate, carbonate and fluoride. The chloride and nitrate are soluble in alcohol while all the compounds of lithium color the flame a brilliant crimson. It is interesting to note that lithium is the only metal to absorb nitrogen even in the cold.

One of the more important and widespread of the minerals of lithium is Spodumene. This mineral was so named by B. J. d'Andrada e Sylva, in 1800, from the Greek (*spodios*) meaning ash-colored, in allusion to the grey color of the mineral. Not long afterwards J. R. Haiiy termed it triphane. Spodumene is lithium, aluminum silicate and contains 4 to 8% of Li_2O with traces of Rb_2O . Its composition is represented by the formula $\text{Li}_2\text{O}, \text{Al}_2\text{O}_3, 4\text{SiO}_2$. The hardness of the mineral is 7 while its specific gravity is 3. Cleavage perfect, sometimes lamellar. The fracture is uneven to sub-conchoidal. Lustre vitreous. Color ranges from greenish-white to amethyst. Streak white. Transparent to translucent. Monoclinic system; twins; prismatic; often flattened; also massive, cleavable.

The original specimens of the mineral came from the isle of Uto in Sodermanland, Sweden, but the finest examples are found in the United States, especially in the state of Massachusetts. Very fine specimens have also been obtained from the Black Hills of South Dakota. In the Etta Tin mine at Harney Peak enormous crystals measuring as much as 42 feet in

(*Jons Jacob Berzelius (Sweden) 1779-1848.)

length and with a cross section of 3 by 6 feet have been found. It is reported that 37 tons of spodumene have been mined from a single crystal.

A transparent yellow variety of spodumene has been reported found in Brazil by a mineralogist named Pisani and since its discovery it has been extensively used in the gem trade.

Near Diamantina in Brazil some spodumene of a beautiful blue color is occasionally found. The two varieties of spodumene however which eclipse all others by their beauty are Hiddenite and Kunzite.

Kunzite is a transparent lilac-colored variety of spodumene, which upon the suggestion of the mineralogist Charles Baskerville, was termed kunzite, in honor of Dr. George Frederick Kunz, in virtue of his work in the gem branch of mineralogy. The first crystals of kunzite were discovered about 1903 a mile and a half northeast from Pala, San Diego county, California; a locality already well known to the mineral world for the great beauty of its tourmaline crystals and lepidolite. Kunzite occurs in large crystals, weighing as much as 1000 grams each, and presents delicate hues ranging from lilac to deep pink. The color is attributed to manganese. Kunzite, almost 7 in hardness, is transparent and pleochroic. Near the surface it may lose color by exposure. But kunzite is interesting not only on account

of its great beauty but also for the fact that a number of scientific tests have revealed in kunzite a remarkable phosphorescence which is excited by X-rays and the proximity of radium salts.

Sir William Crookes in speaking of some experiments made with kunzite says:

But the most interesting thing to me is the effect of radium on it. A few milligrammes of radium bromide brought near the piece of kunzite makes it glow with a fine yellowish light, which does not cease immediately on removal of the radium, but persists for several seconds.

Hiddenite is a transparent green variety of the mineral spodumene. It was discovered by William E. Hidden about 1879 at Stony Point, Alexander county, North Carolina, and was at first taken for diopside. J. Lawrence Smith proved it to be spodumene and named it after its discoverer. Hiddenite occurs in small slender monoclinic crystals of prismatic habit. The color ranges from a pure emerald green to a greenish-yellow and is probably due to the presence of a small amount of chromium. A well-marked prismatic cleavage renders the mineral rather difficult to cut. It is also sometimes inappropriately called by the name of lithia emerald. Five carats is about the maximum weight of cut hiddenite gems and they are cut into step or table stones.



Display of Various Lithium Minerals

The Research Program of the Illinois Geological Survey

The new mineral research program, which has just been inaugurated by the Illinois State Geological Survey, under the leadership of Dr. M. M. Leighton, Chief of the Division, will undoubtedly prove to be just what the mineral industries of that State have been needing, in order that they may recover ground which they have been steadily losing in recent years.

The research program provides for a complete scientific investigation into the composition and potential economic possibilities of all mineral and rock substances occurring in Illinois, and also provides for the study of production and movements of mineral materials both into and out of the state, and of all possible marketing opportunities.

The Geological Survey's staff has been greatly enlarged in order to carry out these researches—a trained corps of chemists and physicists having been appointed to cooperate with the regular geologic staff in this respect.

Their investigations will be carried on in the new Mineral Research Laboratories, which were recently dedicated, and which have been provided by the University of Illinois adjacent to the Geological Survey offices in Urbana.

The investigators have many types of up-to-date laboratory equipment at their disposal in the new quarters, and they are already actively engaged with a number of projects which are destined to benefit several mineral industries. All findings will be revealed for the benefit of Illinois industries as soon as their soundness is established in each case.

Some of the leading rock and mineral substances which will come in for scientific investigation are: coal, oil and gas, clay, shale, limestone, sandstone, sand and gravel, molding sand, fullers' earth, fluorspar, silica sand, tripoli, and ochre.

During its 26 years of geologic field investigations the Geological Survey has outlined tremendous reserves of these natural earth substances, which need the proposed research to reveal their true nature and value for many uses in the

chemical, metallurgical, structural, power and agricultural industries.

The research program, as outlined above, is the outgrowth of organized activity on the part of the Illinois Mineral Industries Committee, which was formed in 1930 for the purpose of putting the plan into effect by securing favorable legislation and adequate appropriations, after the proposal was approved by the State Board of Natural Resources and Conservation. Practically every mineral industry in the State was represented on this committee.

Besides making detailed studies of individual mineral substances, attention will also be given to the possibility of blending different mineral and rock substances for the manufacture of commercial products not now being produced by Illinois industries.

Additional research will be directed towards the location and utilization of materials that have not found their way into industry to date.

Field and Laboratory Facilities

To attain these and other objects within the scope of the Geological Survey, the Survey is adopting the most modern devices for field investigations and is providing laboratory facilities for fundamental physical and chemical studies of the earth's materials and of problems of their utilization, employing whenever available special equipment in the laboratories of the University.

Geochemical Laboratories. The geochemical laboratories of the Survey include an analytical laboratory, a special fuels laboratory, a special non-fuels laboratory, a high temperature laboratory, and an industrial research laboratory.

The analytical laboratory is equipped for proximate and ultimate analysis of coal, analysis of rocks, clays, silica sands, coal ash, brines, etc., extraction and analysis of oils, analysis of gases by the Shepherd modification of the Orsat equipment, and analysis of gases, particularly natural gas, by low temperature fractionation with the Podbielniak equipment.

The fuels laboratory is provided with suitable equipment for fundamental chemical studies in regard to the composition and constitution of coal, oil and gas.

The non-fuels laboratory has equipment suitable for physico-chemical studies on the non-fuel minerals.

The high temperature laboratory contains gas and electric furnaces for the use of the analytical and research laboratories and an electric pyrometer which is connected through a multiple point switch to thermocouples from each furnace where temperature control is desired.

Provision is made for equipment for fundamental studies on problems of industrial application of research results in the industrial research laboratory.

The University of Illinois, in its Department of Chemistry, will cooperate in the use of its X-ray equipment on problems requiring X-ray photographs.

Laboratory of Coal Microscopy. This laboratory of the Coal Division is equipped to obtain complete columnar samples of the coal beds, to prepare polished sections and thin sections, to examine these under high power microscopes, and to photograph thin sections on a magnification as high as approximately 1000 diameters. In this laboratory the maceration products of coal

are also studied as a part of the study of the constitution of coal.

Non-Fuels Laboratories. The non-fuels laboratories are equipped in themselves, or with the cooperation of the State Highway Division and the Department of Ceramic Engineering of the University of Illinois, to undertake the wide variety of physical tests and studies necessary to accurately determine the physical composition and properties of the state's non-fuel minerals. Modern laboratory crushing and drying machinery for preparing earth materials for study are provided as well as microscopes for the examination of these materials and their commercial products.

Laboratory of Sedimentary Petrography. This laboratory is equipped for the making of thin sections of unconsolidated materials, as well as consolidated, for the separation of heavy minerals, and for the microscopic determination of mineral and rock constituents.

Laboratory of Geophysics. This laboratory is equipped for the study of porosity, texture, saturation with oil, and other features of cores of oil sands, and for the determination of oil reserves in the various oil-sand horizons of the State's oil fields.

Equipment for field geophysical studies include an Askania magnetometer and a Megger apparatus for determining electrical resistivity of earth materials.

A New Occurrence of Spodumene

—By—

WILLIAM BURR GIBSON, Dr. Sc.

Baldwin, N. Y.

This discovery was made by my friend Gabriel Martin Cardoso, professor of X-Ray mineralogy at the University of Madrid (Spain). During 1930 he made an expedition to the Pontevedra area of Spain to study the pegmatite dykes of that region and found this occurrence of spodumene near the village of Lalin (Pontevedra), a territory rich in pegmatite dykes.

Professor Cardoso reports that one dyke upon first examination appeared to be ordinary pegmatite, with quartz, abundant feldspar and some mica. However, on closer attention, it was observed that

not all the white material offered the characteristics of feldspar, but a large part reminded of amblygonite. The dull surfaces record the fractures and exfoliation faces in more or less sinuous fringes, while the fresh material was of a brilliant clear green color. Chemical and microscopic examination proved the mineral to be Spodumene.

Crystals were present but not of sufficient size and clearness as to be of any value in the gem trade.

Cassiterite, wolframite, lepidolite and apatite accompanied the spodumene though present in small amounts.

Witherite in Alaska

—By—

VICTOR SHAW

Loring, Alaska

A RECENT discovery of an important deposit of witherite (barium carbonate) in Southeastern Alaska is of general interest not alone because it is the first ever found in the Territory but also because until its discovery there were but three other such deposits known in North America: Kentucky, Ontario and California.

The Alaskan find has just been made by George Comstock and two associates near Security Bay, on the northern end of Kuiu Island lying some 75 miles off the coast and about 90 miles south and west from Juneau. The original discovery was in the form of several tons of rounded pebbles on the beach. Later a number of mining claims were staked a short distance back from the water, which contain numerous veins of barite in a limestone formation.

Testing and development are proceeding to determine the extent and purity of the deposit with a view to future exploitation. Samples tested thus far show an almost pure barium carbonate, with no other mineral present. The latest quotations on witherite are \$47 a ton for 200 mesh and \$44 for 100 mesh, for the ground and finished product.

Witherite is one of the rarer minerals. Its color is white, pale yellowish or grayish; lustre vitreous inclining to resinous on fracture edges, and crystallizing in orthorhombic prisms and pyramids being translucent in crystal form. It is brittle, with one distinct cleavage and its streak

is white. Its chemical symbol is BaCO_3 , of which 22.3 is carbon dioxide and 77.7 is barium carbonate. Its hardness is 3-3.75. It fuses easily and dissolves in HCl . In fact, it differs from scheelite in its easy fusibility, effervescence in acid and in being softer, since scheelite hardness is 5 in the scale.

Witherite took its name from Withering who first discovered it in Scotland in 1783. Although found also in Siberia, Hungary, Russia and Chili, it is mined chiefly at Fallowfield, England. It is used commercially as a chemical reagent in producing certain pigments, as a filler for wall papers, in oil drilling, sugar refining, as a rat poison and other uses.

Commercial barium carbonate is a dense white powder having a specific gravity of 4.275, and is obtained when a solution of barium chloride is poured into an excess of a hot solution of ammonium carbonate. One liter of water at 10°C dissolves only 0.02 grams of witherite, but if the water contains carbonic acid the mineral is more soluble.

Taking advantage of this property, an excellent, safe rat poison is produced. Barium carbonate being very insoluble in water does not dissolve when sprinkled upon rat bait, and is therefore tasteless. When in the stomach of the rodent, the mineral reacts with the hydrochloric acid of the gastric juices to form barium chloride, which is a deadly poison.

The largest number of votes received to date for our Mineral Contest total 110 and were sent us by the Maine Mineralogical and Geological Society of Portland, Maine. The next highest total is 104 and is credited to the Geology Class of Georgia Institute of Technology, Atlanta, Ga.

The largest number of ballots ordered to date for our Mineral Contest is 2,000 and they were sent to The Gem Shop of Helena, Montana. This progressive firm is distributing the ballots among its many customers and hundreds of the filled-out ballots have reached us so far.

Coquina Rock

—By—

MRS. LILLIAN L. BLAISDELL,
St. Augustine, Fla.

That the east coast of Florida, near the site of the city of St. Augustine, stood at a lower level during the Pleistocene Age is evident from the occurrence of marine shell deposits of Pleistocene Age at some distance inland and at an elevation of several feet above sea-level. The shell stratum, often described as Coquina (Spanish, "shell fish"), extends to a depth of 60 feet below the surface of the city.

Coquina rock is composed of shells and shell fragments which have been partially dissolved by rain water and cemented together. The predominating shell is the Donax, or Coquina clam. The Donax is eagerly gathered by the bathers at our beaches during the summer months as it is edible and makes a delicious broth which is called "Periwinkle Soup."

The accompanying photograph shows a marker made of coquina rock which came from a quarry located on Anastasia Island. This island, which is largely composed of coquina sand and coquina rock, lies adjacent to the Atlantic Ocean and is separated from the city of St. Augustine by the Matanzas Bay. The inscription on the bronze tablet reads:

OLD SPANISH TRAIL
ZERO MILESTONE
ST. AUGUSTINE, FLA.
TO
SAN DIEGO, CALIFORNIA
ERECTED AND DEDICATED BY
THE EXCHANGE CLUB
OF ST. AUGUSTINE
A. D. 1928



Old Spanish Trail Zero Milestone, St. Augustine, Florida, to San Diego, California.
Erected and dedicated by the Exchange Club of St. Augustine, A. D., 1928.

Bureau of Mines Notes and News Items

Contributed by the
U. S. BUREAU OF MINES
Washington, D. C.

Pyrite, which, owing to its yellow color, has so frequently been mistaken for gold as to earn the name of "fools gold", has a number of important commercial uses, according to the Bureau of Mines. The principal uses for pyrite are in the manufacture of sulphuric acid and sulphite wood pulp. Pyrite is used in smelters as a fluxing agent to furnish iron for the slag. Minor uses of pyrite are in radios, jewelry, vermilion paints, or for the manufacture of copperas, which is used in dyes, writing ink, wood preservatives, disinfectant, and certain kinds of fertilizers. In late historic times it was used in some of the old wheel-lock guns.

The most important pyrite deposits occur in the province of Huelva, Spain, and in the province of Alemtejo, Portugal. Other important deposits occur in Norway, Japan, Italy, Germany, France and the United States. Spain has been the principal source of pyrite for many years and in 1929 it produced about 50 per cent of the world output.

Further details are given in Information Circular 6523, copies of which may be obtained from the Bureau of Mines.

It is a common misconception that all yellow stones are topazes and that all topazes are yellow; but neither statement is true, according to the Bureau of Mines. The real topaz is a rather rare mineral and a large number of yellow stones that masquerade as topaz are nothing more than yellow quartz, known as citrine, but almost universally called topaz. The true topaz is often called "Brazilian" topaz by the jeweler to distinguish it from yellow quartz; nevertheless, both terms are freely applied in trade to other yellow stones.

Topaz is considered the most popular

yellow stone for jewelry and is often used as the principal stone in brooches or pendants, especially in old-fashioned ornaments, says I. Aitkens, in a report recently published by the Bureau. However, many other species yield pretty yellow stones, some of which are far more numerous and less costly than the topaz.

True or Brazilian topaz is noted for its hardness; very few minerals are harder. It will cut quartz and tourmaline easily, but is very brittle.

Additional details are given in Information Circular 6502, "Topaz", copies of which may be obtained from the Bureau of Mines.

Hafnium, one of the most abundant of the newly discovered elements, has not yet found a definite place for itself in industry, according to the Bureau of Mines. A commercial future for hafnium is, however, already glimpsed in the radio industry, and its high melting point and electronic emissivity have already led to the taking out of patents for its use in radio tubes and incandescent electric lamp filaments and for the cathode surfaces of devices such as X-ray tubes and rectifiers.

Hafnium, which is element number 72, takes its name from Hafniae, the Latin name for Copenhagen, Denmark, where the research work of Coster and Hevesy, discoverers of the element, was performed, says Paul M. Tyler, in a report recently published by the Bureau. Hafnium has so far been found only as a minor constituent of zirconium minerals.

Further details are given in Information Circular 6457, "Hafnium", copies of which may be obtained from the Bureau.

Bohemia is the principal source of gem garnet. In fact, for many years it has been almost the only commercial source of the common ruby garnet found in the jewelers' shops, according to the Bureau of Mines.

The fiery red pyrope constitutes the chief supply of Bohemia garnet, and is undoubtedly the most popular variety of semi-precious garnet. The most noted region is about 60 kilometers north of Prague, and it is claimed that this is probably the only place in the world in which the collection and preparation of gem garnet for the market has been sufficiently important to approach an established industry.

The production of gem garnet in the United States has always been exceedingly small, says I. Aitkens, in a report recently published by the Bureau. Although the mineral is widely distributed through the states and considerable garnet of gem quality has been collected, the annual output since 1901 has declined. Garnet deposits occur in Arizona, California, Colorado, Idaho, Massachusetts, New Hampshire, New York, North Carolina, Pennsylvania and Alaska.

Garnets, although very attractive stones are so abundant that they are not highly valued. To escape the sales resistance that their lack of rarity engenders, garnets are often marketed under such suggestive names as "Cape ruby", "Uralian emerald," "South African jade", and similar terms.

Further details are given in Information Circular 6518, "Garnets", copies of which may be obtained from the Bureau.

Tourmalines, says I. Aitkens, in Information Circular 6539, "Tourmaline", are among the most beautiful of all the semi-precious stones, and are unsurpassed even by the corundum in variety of hue. The stones most suited to jewelry purposes are those comparatively free from iron. One reason for the fact that the tourmaline has advanced rapidly in public favor in this country is that it is found in California in great profusion and of extra-ordinary quality. The superb green and especially the pink crystals found at Pala and Mesa Grande in San Diego County, California, are deemed superior to tourmalines from all other localities.

Platinum and its allied metals osmium, iridium, rhodium, palladium and ruthenium are the most costly of the better-known metals and combine properties that make them unique among the elements, say Paul M. Tyler and R. M. Santmyers in Information Circular 6399, "Platinum", which may be obtained from the Bureau. For a number of isolated uses none will replace platinum in many of its varied uses, and there is a large and growing demand for purposes for which no economical substitutes are known.

For many years before 1914 the world obtained its supply of platinum metals primarily from Russia, which before the war produced as much as 300,000 ounces in a year, or approximately 95 per cent of the world output. Despite fluctuations due to internal political disturbances Colombia managed to account for 3 to 4 per cent, leaving the rest of the world to furnish the remaining 1 to 2 per cent.

After the World War and the Revolution of 1917 the Russian output fell off to about 20,000 to 25,000 ounces annually. In Columbia, on the other hand, the government became stable, and under the stimulus of increasing prices production advanced fairly rapidly, but even the high figure of 40,000 ounces attained in 1922 failed to compensate for the virtual collapse of Russian mining.

Thallium is one of the rare metals that has come into commercial use within recent years, says Alice V. Petar in Information Circular 6453, "Thallium", a copy of which may be obtained from the Bureau. Its comparative scarcity, combined with a resemblance to the common metal lead, have retarded the development of uses for thallium. Although production is still measured in pounds rather than in tons, it is now finding application in a number of fields. Perhaps the earliest commercial use of thallium was as a constituent of optical glass of higher refractive power than similar glasses containing lead. One of the later applications to attract attention was the use of the oxysulphide in a sensitive electrical device similar to the selenium cell.

Field Museum Notes and News Items

Contributed by

THE FIELD MUSEUM OF NATURAL HISTORY
Chicago, Ill.

Collections of gold, silver and copper ores of Japan have been placed on exhibition in the mineral division of the department of geology at the Museum. The material was presented to the Museum by the Association of Mine Owners of Japan. These metals have been mined in Japan during the past 1,000 to 1,200 years, according to Henry W. Nichols Associate Curator of Geology. The principal deposits are on the islands of Honshu, Sado, Skikoku and Kyushu. The same ore often bears two, or all three of the metals. The collection is exhibited in Frederick J. V. Skiff hall of the Museum.

A large specimen of lodestone, weighing 400 pounds, and possessing unusually strong magnetic power, is to be seen in the department of geology at the Museum. It is installed in such a manner the visitors may test its magnetism.

In Chicago one may now, by simply crossing Grant Park to the Museum, step backwards in time some 250,000,000 years to the earth as it was in the coal age. A restoration of a luxuriant carboniferous forest with its gigantic and peculiar trees and plants such as the lepidodendrons and sigillarias was opened to the public not long ago. Not only the trees and plants which were destined to turn, after millions upon millions of years, into the coal which keeps modern industry going, are seen in this exhibit, but also the primitive animal life of the forest including giant insects such as dragon flies with a spread of wing of more than two feet, and cockroaches more than three and one-half inches long. All these things and many others are restored in natural size and lifelike aspect in the new museum group.

More than one and one-half million persons visited the Museum during 1931 it was announced recently by Stephen S. Simms, Director of the Institution. The exact number of visitors, when the figures were checked at closing time Thursday, December 31st, was 1,515,463.

This is a new record for a year's attendance, and makes the fifth consecutive year in which the one million figure has been exceeded.

A collection of fossil bones, including several complete skeletons, of pre-historic animals found in the famous Rancho la Brea asphaltum pits in the city of Los Angeles, Calif., has been placed on exhibition in Ernest R. Grahm Hall of Historical Geology at the Museum. These animals lived during the Pleistocene period, one to one and one-half million years ago.

Complete skeletons of the saber-tooth tiger, and the pre-historic type of wolf are included. Other animals, represented by partial skeletal remains, are a pre-historic kind of horse, a ground sloth, a primitive coyote, and bison, condor and eagle.

Fossils were first discovered in these tar pits in 1908, and since then, scientists have unearthed some ninety species of pre-historic creatures there, according to Elmer S. Riggs, Associate Curator of Paleontology.

Also in the hall is a large mural painting by Charles R. Knight restoring these animals as they appeared in life.

Another addition to the exhibits in this hall consists of two skulls of rhinoceroses which lived in the Bad Lands of Nebraska in the Oligocene period, about 35,000,000 to 39,000,000 years ago.

Interesting Localities and How to Reach Them

A LOCALITY FOR GEODES

—By—

FRED W. SCHMELTZ,

2510 Maclay Ave., New York, N. Y.

A rather limited area where geodes up to five inches in diameter can be found is located in San Bernardino county, about 35 miles northwest of Needles, California. It is reached from Needles by going west on the U. S. 66 highway to Goffs, turning right on the road to Vontrigger Springs, 10 miles distant. Vontrigger Springs consists of nothing else but White's ranch. Here take the road to the left to its very end, where there will be found a prospect tunnel. There are no buildings of any kind here, though a small group of shacks will be met with about a mile before the tunnel is reached, or about 3 miles after leaving Vontrigger Springs.

The geodes are found about $\frac{1}{2}$ mile away from the tunnel, and towards the right and on the slope of the same hill. They lie just at or slightly under the surface of the ground.

When broken open, the geodes show a heavy outside layer of red jasper, a thin layer of black chalcedony, then a thin layer of translucent chalcedony and an inside coating of opal, though the latter is sometimes absent. Gold has also been found in the geodes and occurs with the jasper.

The rock formation here is rhyolite cut by dikes of andesite. Calcite has been exposed in the tunnel.



A Geode from the locality which has been cut in two and polished. Left shows the rough outside surface; right shows the polished inside surface.

The Amateur Lapidary

Conducted by

J. H. HOWARD*

504 Crescent Ave., Greenville, S. C.

Amateur and professional lapidaries are cordially invited to submit contributions and so make this department of interest to all.

*Author of—*The Working of Semi-Precious Stones*. A practical guide-book written in untechnical language for those who desire to cut and polish semi-precious stones.

THE ART OF DRILLING GEM STONES

— By —

M. FRED BUTOW

Before the dawn of history men were drilling gem stones. In museums we find countless examples of fine piercing or drilling, much of it done by prehistoric man. It is an interesting line of thought that the essentials of this art as practiced today are the same as when the first stone was drilled. Man has discovered and invented many wonderful materials and ingenious processes but up to the present the only way to drill a hard stone is with a harder stone and Mother Nature furnishes us today with these harder stones just as they were found by the Stone Age man.

Another interesting speculation is; how did man discover that he could drill a semi-precious gem stone with a piece of diamond or corundum? Assume that one of our ancestors had a favorite "fire maker", say a slab of quartz and a sharp piece of corundum. On many a cold winter morning this faithful pair of stones gave forth a nice fat spark and in short order he had a roaring fire at the mouth of his cave. So he guarded this pair of stones carefully and used them many times. He quite naturally got the habit of holding them in a certain way and striking them together in a certain place. After a while he noticed

that there was quite a depression in the quartz slab while the corundum fragment showed but little wear. From this discovery it would be only a step to rubbing a hole in the softer stone first with a reciprocating motion and then another short step to the rotary motion.

After the art had developed to the point of using a rotary drill and drilling small holes, we do not know just how the stone which formed the drill point was attached to the spindle. Doubtless, ways were found to anchor a small fragment of diamond or corundum to the drilling shaft. It is also quite likely that many of these holes were drilled with a soft spindle and powdered diamond or other stone, fed loose into the cut.

We do know of two of the early machines used for this work, and both of them were good enough that they are in use, though to a limited extent, to the present day and sometimes in cities where electric motors abound.

The first of these methods is the "Pump Drill", illustrated in Fig. I, still in use among cutters and jewelers. We know it was used by the early Egyptians; we do not know from whom they got the idea.

A probably later method is shown in

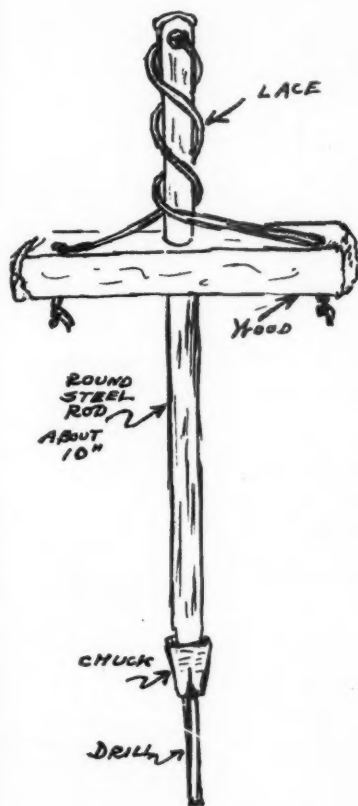


Figure I

Fig. II, illustrating the old fashioned "fiddle bow" drill. Almost any amateur can make and use this tool and the doing of this is an interesting experiment. The sketch is self explanatory. Cement the stone to the plate. Twist the cord around the spindle. Draw cord taut with index finger. Revolve drill by drawing the bow back and forth. Feed oil into the hole with left hand. Lift drill slightly and quite often to insure plenty of oil on the point of the drill.

As stated above the making and using of this tool is an interesting experiment but with our ideas of speed attuned to the

modern tempo the results will be considered slow.

If one wishes to get real results he must have a drill press. This press may be hand or foot driven, but an electric motor is best. It must have a spindle without much play or lost motion and it must have a handle for hand feeding (not automatic feeding). The spindle speed should be from 2500-3000 R. P. M. Cement stone to be drilled onto a flat metal plate. Submerge it in a shallow vessel of light oil. (Automobile flushing oil is good and is cheap.) Use a diamond drill firmly tightened in the chuck, and running true. Now bring the drill down very gently against the work. Feed it very slowly and lift frequently to clear fragments and dust out of the hole and also to prevent excessive heating of the drill. The pressure to be used must be determined by experience and is most important. If the pressure is too light no cutting will result. If it is too heavy the diamonds will be twisted from the shank, and most likely broken. Extreme care must be used when the drill "breaks through"; lighten the pressure for the last 1/16" of the hole or the stone will certainly flake and the diamond drill will probably be ruined.

Up to this point it has been presumed that the beginner will buy his first drills, and this is recommended. But for the benefit of any ambitious novice who thinks he can make his own the following description of the making will be helpful. The novice can make them, or rather can learn to make them. But he will build the knowledge on a good many failures.

There are three general classes of diamonds. One class which includes the gem variety is highly crystallized, has distinct cleavage planes and splits easily. It is not suitable for making drills because of this tendency to split. Another class is bortz, a poorly crystallized diamond, useful in many industrial operations but due to its tendency to break on definite lines not best for our purpose. The ideal stone for our drill making is "carbonado" or black diamond. It is as hard as any diamond but is uncrystallized. It is tough, with no tendency to split and break. Therefore use "carbonado" and proceed as follows:

Select a stone three or four times as large as the fragments you will want to use. Hold it with the fingers in a ves-

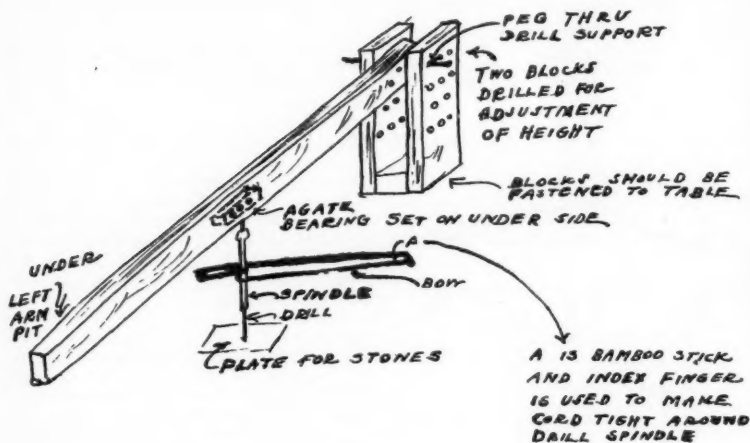


Figure II

sel with walls high enough to keep pieces from being lost when the stone is broken. Put a dull tool against the stone and strike lightly with a hammer, breaking the stone into several pieces. Pick out two pieces as nearly alike as possible, or break further till two pieces about alike are obtained. The ideal condition is to have two pieces identical. This can be done by cementing the stones on sticks and rubbing them on a piece of bortz till each is the shape and size wanted. However, the amateur is not likely to have the necessary bortz, so he should get the stones as similar as possible by breakage.

Take a piece of drill rod of $1/8"$ to $3/16"$ diameter and about $1\frac{1}{2}"$ to $2"$ long. File a V shaped notch in the end

of the rod. See Fig. III-A. Then straighten the sides of the V making it a rectangular slot. Then file the slot down at both sides till the bottom of the slot forms a peak like the roof of a house. See section Fig. III-D. The two similar stones are now put into the slots as shown in Fig. III-E and the two side walls mashed in with pliers till the stones are fairly tight. Fig. III-E. The stones should not quite come together in the center. Leave a small space for a "release" on dead center as cutting speed will be very much slowed up if the diamond rides on a dead center as it revolves. Do not let the diamonds project past nor come quite out to the outer wall of the rod. The idea is to bury these two diamonds completely within

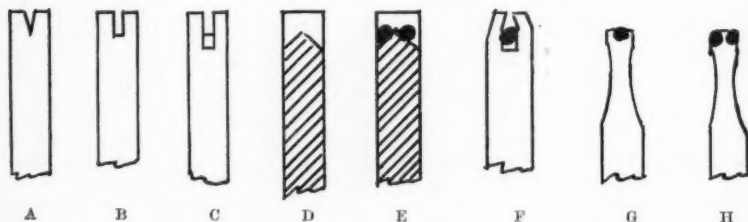


Figure III

the rod and to bury them solidly. Lay the rod down in a horizontal position on an anvil or any solid metal plate and proceed, by revolving the rod slowly and tapping it lightly with a hammer, to close up all the voids around the stones and give them firm seating. When this is done grasp the rod in a vise and file off the front of the rod till the diamonds are visible. Then file the sides till the diamonds barely project. It is well in filing the sides to chuck the rod in the drill press and do the final grinding with a file held against the rod while it is revolving. The sides of the rod must not be left straight. Some clearance must be

provided. See Fig. III-G, which shows the correct shape somewhat exaggerated. This "fishtail taper" is of course necessary to provide clearance but it is also valuable in allowing free flow of the lubricant to the point of the drill.

Be careful while hammering the drill to not strike it too hard. The stones can stand a considerable pressure but a very slight sharp blow may break them.

As to the size of the drill; the smaller drills, about 1/16" do the neater job but naturally they are quite frail and much harder to make. It is suggested that the first attempts be directed to drills about 1/8" diameter.

PRICE CORRECTION

William Dixon, Inc., was given as a source of certain supplies recommended in "The Working of Semi-Precious Stones". There were a number of price discrepancies which we wish to correct here. That Company now quotes as follows:

5 lbs. Medium Powdered Pumice, Fig. 20279, 10c per lb.

25 lbs. Lots ditto, 7c per lb.

6" x 1/2" Grade D Hard Felt Wheels, Fig. 20187, Approximately \$2.20 each.

6" x 1" Poplar Laps, Fig. 20521, 45c each.

8" x 1" Poplar Laps, Fig. 20521, 80c each.

We are glad to make these corrections.

J. H. HOWARD.

MINERAL LOCALITIES INFORMATION DEPARTMENT

Members desiring information regarding minerals or mineral localities in the following states may obtain it by writing to the Collectors listed and enclosing a self-addressed stamped envelope.

- | | |
|--|--|
| Oregon, Southern Idaho, Northern Nevada | { Dr. Henry C. Dake, 793 1/2 Thurman Street, Portland, Ore. |
| The Oregon Coast, South and Western Oregon, Northern California, Southern Washington | { John M. Tracy, 601 Orange Street, Portland, Ore. |
| Petrological Information in Central Eastern Iowa | { Prof. Wm. J. H. Knappe, Curator, Wartburg College Museum, Clinton, Iowa. |
| Massachusetts | { Edward C. Foster, 1 Kingsley Ave., Haydenville, Mass. |
| Pacific Southwest, especially Southern and Central California | { Edwin V. Van Amringe, Department of Geology, Pasadena Junior College, Pasadena, Calif. |
| Western Connecticut | { Wilbur J. Elwell, R. F. D. No. 4, Box 18, Danbury, Conn. |

Our Junior Collectors

Some Day They May Be Our Leading Mineralogists

CLYDE D. ALLAN

Clyde D. Allan of 1221 W. Fourth St., Waterloo, Iowa, is 15 years old, a sophomore at West Waterloo High School, and an active mineral collector. He has traveled extensively throughout the Rocky Mountains collecting minerals and his collection now totals over 350 fine specimens of classified and labeled rocks, minerals, ores, crystals, gems and fossils. His specialty is quartz of which he has 73 specimens.

In the picture, Clyde is holding a quartzite slab which shows evidence of glacial phenomena in the way of inclusions of glacial-worn pebbles. The little stand at his left holds fossils from

the famous Mazon Creek fossil beds in Illinois.

The cabinet housing the collection, as well as all trays and stands, were made by Clyde which proves he is an expert carpenter. We bet many of our young readers wish they had a cabinet as nice as Clyde's or a collection as good as his! Just note how nicely the collection is displayed! And Clyde has a small laboratory, too, in the basement of his home where he tests minerals.

And in conclusion we are pleased to say Clyde is an expert xylophonist and that he would be pleased to correspond with any collector who may care to write him.



Clyde D. Allan and His Collection

MY DISCOVERY OF COPIAPITE

—By—

BETTY E. B. YOUNGMAN

(15 years old)

2100 Eagle Ave., Alameda, Calif.

One sunny morning four of us girls decided to go on a hike; they just for the sake of hiking, and I, to collect minerals beside.

We took a street car out to Leona Heights and got off at the end of the line. We hiked into the hills for about one mile along the side of a creek.

There are quite a few sulphur mines up there but most of them have been abandoned. There are yellowish masses of impure sulphur in places and there are quite a number of crystals of iron pyrite to be found sprinkled through the rocks but most of the crystals are very small. The iron pyrite is mined for the sulphur it contains.

By the time we had hiked for a mile over slippery rocks, we were ready to eat. We found a shady spot where we sat down and had lunch. After lunch we

did a little exploring and ran across an abandoned mine that was partly boarded up. We went inside a little ways and found it very damp and cold. There were some evil-smelling gases, too—compounds of sulphur—and we didn't go in very far or stay long as you can well imagine.

A creek nearby, which had worn its way through the side of a cliff, had deposited some sulphur-bearing minerals along its course. My curiosity was aroused and I went down after some of it. I collected some very good specimens which proved later to be copiapite.

Copiapite is a ferric sulphide and occurs here in small crystals of a whitish-yellow color. It is also found in masses of impure sulphur.

Editor's Note:—A nice specimen of the copiapite was sent to the Editor by Miss Betty.

Raymond Seeburger of 1224 —44th St., Des Moines, Iowa, is one of our young subscribers and only 11 years old. With the assistance of his sister, Louise, and of his brother, Albert, he has opened up the Seeburger Museum of Natural Sciences at his home. This little museum draws many visitors, science classes of the local schools, boy and girl scout troops, and others, and as a result many new collections have been started in his city. Raymond is the Curator of the Department of Mineralogy and Paleontology, Louise is the Curator of the Department of Botany and Ethnology, and Albert is the Curator of the Department of Entomology.

Ben Bagrowski of Milwaukee, Wisc., sent in 50 votes for our mineral contest and has given us assurance of obtaining many more.

Thomas T. Rogers, of 1227 N. 30th Milwaukee, Wisc., is only 9 years old and has now a collection of 77 specimens. Thomas is one of our youngest subscribers and readers.

**Preliminary Announcement
of
COURSES IN GEOGRAPHY AND
GEOLOGY
TO BE GIVEN IN THE SUMMER
SESSION 1932
June 20 to August 13**

SCX. Geological Field Course in the Lake Superior Region—Prerequisites: open to men students who have completed at least a year college course in geology. This course lasts for four weeks and begins about August 10. Credit, six semester-hours. Professors Grant and Stark.

SD2. Research in Geography or Geology—The work is of a semi-independent nature for those competent to work on special subjects. Topics may be related to or be made the basis of a thesis for an advanced degree. Graduate students may, if prepared, complete the resident requirements for a master's degree in three successive summers. Credit, one to eight semester-hours. Professors Grant, Miller and Stark.

For further information address the Department of Geology and Geography, Northwestern University, 18 University Hall, Evanston, Illinois.

Club and Society Notes

MAINE MINERALOGICAL AND GEOLOGICAL SOCIETY

The Maine Mineralogical and Geological Society was organized on January 27, 1927, with a desire to promote social intercourse and to disseminate knowledge of Maine minerals, their occurrence, their distribution and their uses. The original membership was 9; its present membership is 66.

Membership in the Society is open to all interested in Maine minerals. The

dues are nominal. Those interested in becoming members are requested to write the Secretary, Kenneth E. Chick, 70 Alba St., Woodfords, Maine.

The officers of the society for 1932 are:—Leonard H. Starbird, President; Edward H. Leonard, Vice-President; Charles M. Mower, Treasurer; Kenneth E. Chick, Secretary.

THE GEMOLOGICAL SOCIETY OF AMERICA

On January 15, 1931, an enthusiastic group consisting almost entirely of jewelers and diamond dealers met at the Public Library in Los Angeles, Calif., and organized the Gemological Society of America. This Society is the outgrowth of the interest shown by the classes in gemology which had been conducted by Robert M. Shipley, Gemological Diplomat, at the University of Southern California.

The Gemological Society has as its purpose the advancement of the scientific and practical study of gemology by jewelers and others who are interested and the furtherance of a greater appreciation of diamonds and gems on the part of the American people.

A correspondence course in gemology under the supervision of Mr. Shipley, is given by the Society; Mr. Shipley also

conducts classes in gemology in Los Angeles and its environs.

The Gemological Society of America promises to become a powerful organization and branches will be opened in various cities throughout the country when a sufficiently large number of members in these cities are enrolled. The correspondence course offered by the Society offers jewelers and gem students scientific training and it will help the Society to spread over the whole country.

Particulars regarding the classes in gemology held at Los Angeles and the corresponding course, may be obtained direct from Mr. Robert M. Shipley, care of Gemological Society of America, 3511 W. 6th St., Los Angeles, Calif. Particulars regarding the Society may be had from the Secretary, Mr. George H. Marcher, 800 W. 6th St., Los Angeles.

At Northwestern University in the Department of Geology and Geography during the first semester of the current academic year visiting lecturers and their subjects included. Dr. G. H. Cady, Illinois Geol. Survey ("Classification of Coal"); Prof. A. N. Winchell, University of Wisconsin ("The Origin of the Graphite in Veins and Pegmatites"); Dr. G. F. Loughlin, U. S. Geol. Survey ("The Ore Deposits of Cripple Creek,

Colorado"); Dr. D. G. Thompson, U. S. Geol. Survey ("The Work of the Ground Water Section of the U. S. Geological Survey"); Prof. A. C. Noe, University of Chicago ("A Geologist in Russia"); Mr. Thos. A. Hendricks, U. S. Geol. Survey ("Oklahoma Coal Measures"); Dr. T. S. Lovering, U. S. Geol. Survey ("The Geology of the Moffat Tunnel" and "The Mineral Belt of the Front Range, Colorado").

Bibliographical Notes

Mining in Yugoslavia:—By Joso Lakatos, Editor-in-Chief of the Yugoslav Lloyd. 84 pages.

This little pamphlet contains many pages of statistics of mineral output that is of value to those desiring information on this interesting country. A map showing the most important mines and ore deposits of Yugoslavia is also included.

Copies of the pamphlet may be obtained free on request from the Economic Information Service of Yugoslavia which maintains an office at 347 Fifth Ave., New York, N. Y.

from the *Mineralogical Magazine*, September, 1931, Vol. XXII, No. 134, pp. 614-632). The pamphlet lists alphabetically a number of new mineral names with a brief description of each.

Through the courtesy of the Rensselaer Polytechnic Institute, members of Rocks and Minerals Association may obtain complimentary copies of Bulletin No. 34 of its Engineering and Science Series, "Tables and Charts of Specific Gravity and Hardness for Use in the Determination of Minerals", by Joseph L. Rosenholtz and Dudley T. Smith. Kindly address requests to Rensselaer Polytechnic Institute, Engineering and Science Series, Troy, N. Y.

Twelfth List of New Mineral Names:—By L. J. Spencer, M. A., Sc. D., F. R. S.; Keeper of Minerals in the British Museum of Natural History. (Reprinted

THE ROCKS AND MINERALS ASSOCIATION

PEEKSKILL, N. Y., U. S. A.

Organized to stimulate public interest in geology and mineralogy and to endeavor to have courses in these subjects introduced in the curricula of the public school systems; to revive a general interest in minerals and mineral collecting; to instruct beginners as to how a collection can be made and cared for; to keep an accurate and permanent record of all mineral localities and minerals found there and to print same for distribution; to encourage the search for new minerals that have not as yet been discovered; and to endeavor to secure the practical conservation of mineral localities and unusual rock formations.

Honorary President

Dr. Henry C. Duke, 793½ Thurman St., Portland, Ore.

Honorary Vice-Presidents

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Dr. L. J. Spencer, Keeper of Minerals, British Museum, London, England.

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Noyes B. Livingston, 1605 Virginia Place, Fort Worth, Texas.

Benjamin T. Diamond, M. A., 2020 E. 41st St., Brooklyn, N. Y.

M. Mawby, 330 Chloride St., Broken Hill, N. S. W., Australia.

Edward Cahen, Birds Fountain, Dunsford, Exeter, Devonshire, England.

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Peter Zodac, Peekskill, N. Y.

Membership Department

New Members Enrolled—Oct. 20, 1931—Jan. 20, 1932.

THE HONOR ROLL FOR 1931

New Members Secured Since January 1st, by:

The Gem Shop, Helena, Montana	40
Edmund H. Cienkowski, Philadelphia, Pa.	25
John A. Renshaw, Arcadia, California	21
John W. Hilton, Thermal, California	10
Ward's Natural Science Est., Rochester, N. Y.	10
R. J. Santschi, Glen Ellyn, Illinois	9
James L. Riland, Meeker, Colorado	7
Boodle, Lane, Galena, Kansas	6
John Grenzig, Brooklyn, N. Y.	6

ARIZONA

Adamana—Nelson, Mrs. W.
Douglas—Beard, R. R.
Tempe—State Teachers' College

CALIFORNIA

Brawley—Wood, Chas. R.
Colton—Edward, S. C.
Fresno—Reiss, Joe
Little Lake—Bramlette, Wales G.
Oakland—S. F. B. R. Mineral Club
Orange—Pitcher, Lawrence
Santa Ana—Rahlmann, E. A.
Santa Barbara—Varick, Dr. William R.
Yermo—Lane, Mrs. Lucy B.

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Colorado Springs—Good, Don

CONNECTICUT

Bethel—Marshall, E. M.
New Haven—Ford, Prof. Wm. E.
Wapping—Wapping School

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Washington—Ewell, Raymond H.

GEORGIA

Augusta—Steele, Louie

ILLINOIS

Cicero—Rezabek, Stanley
Zbetovsky, J. J.
Denver—Siegfried, H. I.
East St. Louis—Clark Jr. High School

INDIANA

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King, Sr., Terry T.

IOWA

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Lumbard, Melville A.
Waterloo—Corey, Geo. A.

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Houlton—Bicher, Roy A.
Portland—Foster, Philip C.

MARYLAND

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MASSACHUSETTS

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Bernardston—Harris, A. H.
Chestnut Hill—Carter, Winthrop L.
Greenfield—Winslow, Charles E.

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Saginaw—Christie, Russell B.

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St. Joseph—Carpenter, Cyril A.

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Red Lodge—Richie, Herbert

NEBRASKA

Springfield—Olderog, Carl H.

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Beowawe—Roth, John
Las Vegas—Shamberger, C. E., Hugh A.
Reno—Glazar, R. K.

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Franklin—Bauer, Lawson H.
Evans, Mr.
Hasbrouck Heights—Longendyke, S.
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Leonia—Weber, Jay A.
Newark—Clark, M. H.
Di Mattia, Angelo
Ridgewood—Forman, Roger D.

NEW YORK

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Williams, Robert C.
Buffalo—Public Library
Reimann, Irving G.
Cooperstown—McIver, M. A.
Elmira—Holmes, Miss Edith
New York—Dreher, H. O.
Ransom, M. L.
Smith, Charles F.
Stoll, Jack M.
Yugoslav T. & T. Inf. Office
Rochester—List, Miss Hilda
Rockwell, Fred G.
Schenectady—Fehling, Maynard H.
Troy—Rosenholtz, Prof. Joseph L.
Woodhaven—Schneider, Fred W.

NORTH CAROLINA

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OHIO

Cleveland—Braasch, Theodor
Columbus—Koontz, Wm. P.
Delphos—Miller, Gilbert P.
Miamisburg—Gebhart, B. R.

OKLAHOMA

Bartlesville—Shelthrop, M. A.

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Klamath Falls—Research Mining Co.
La Grande—Williamson, Miss Marjorie
Pendleton—Vincent, Miss Mary S.
Roseburg—Printz, W. Harold
Silverton—Coffman, Frank
Stauffer—Forbes, P. L.

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Lancaster—Landis, D. H.
Olyphant—Brozos, Peter
Pittsburgh—Hankinson, Robert
Taber, George H.
Ronks—Esbenshade, Miss Eliza H.
Shippensburg—Ryder, Edwin W.

SOUTH DAKOTA

Oelrichs—Luschei, E. G.

UTAH

Salt Lake City—Dowd, Dr. James E.

VERMONT

Springfield—Baker, Guy E.

WISCONSIN

Milwaukee—Bagrowski, Ben

WEST VIRGINIA

Philippi—Standard Garage

EUROPE

RUSSIA

Moscow—Nautscnoij Biblioteke

AFRICA

NORTHERN RHODESIA

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